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AUG 16 1897

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXVII.—No. 7. Whole No. 1,158. | NEW YORK, MONDAY, AUGUST 16, 1897. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage —For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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BRIEFLY TOLD.

A PRACTICAL EXAMPLE, ST. PAUL, MINN.—During the past half decade we have had many positive examples that the tax assessor was abroad and active in the land, and that, in "the performance of his duty," he seemed to be particularly alive in the belief that those who had been well taxed before should be taxed all the more. More especially have his energies been directed towards incorporated companies, because such, in the past, having been prompt in their payment could reasonably be calculated upon for fairly quick returns in the future. With other incorporated institutions that give to the State the power to say whether they shall have existence or not, gas companies have recently felt the unequal hand of the State, through its agents for naming taxable rates or valuations, in increased assessment levies. In several instances these burdensome additions have been contested in the courts, which tribunals have, on the whole, manifested by their decisions a fair percentage of dissent against the dictum of the assessors. That is to say, in several cases the courts have remitted the assessments to the assessors for correction, on the ground that either the law, in the matter of rating the taxable values, had not been followed, or that the assessments had been put at figures palpably unfair to the corporations assessed. The task of appealing to the law, however, is onerous, both in respect to the length of time so taken up and of the expenditure necessary to carry on the cases to completion; in which light we are more than pleased to note that the proprietors of one gas company in the country have had the courage to recoup themselves without recourse to law. Before briefly stating the particular case in hand, we wish to say that the JOURNAL has, for at least a quarter of a century, been a consistent and strenuous advocate of the soundness of the policy of putting gas rates at figures as low as it was possible to put and keep them, consistent with a fair rate of interest return to those who had their money in the company—which return might be anything up to 8 per cent. per annum; and that in our comment on this St. Paul instance, although we unreservedly hold that the St. Paul Company has acted or proposes to act in a perfectly sustainable way, our advocacy of its act is not to be taken as an indication that our belief in selling gas at the lowest possible figure is any the less pronounced now than it was 25 years ago. Having been taxed upon its real estate, personal property, and about every other thing that it could be taxed, the Board of Equalization of St. Paul finally determined to tax the Company, in a good, round sum, upon the value of its franchise—the particulars in the case will be found in our current item columns, through the text of an explanation given to one of the St. Paul newspapers by Mr. F. W. M. Cutcheon, Vice-President of the Company. In the past the authorities of St. Paul had put upon the Company many obligations to its consumers, in respect of keeping the quality of its product up to a certain illuminating value, and in many other things, too, which obligations, having been fairly lived up to by the Company, made it sufficiently difficult for it to pay its way liberally, on the city's account and on that of its employees, and exist without doing a thing towards "remunerating" its shareholders. In the meantime the Company had strenuously adhered to the policy of selling its product at the very lowest possible rate, and something over a year ago had established a general net price

per 1,000 cubic feet of $1.30, and also had made a sensible concession under these figures per 1,000, on account of gas supplied to the city for its street lamps and public buildings. The concessions seemingly had been ill-timed, for the business depression of 1896 was heavy enough to cut off its trade to the point that dividends at the figure formerly paid had to be cut down, and in the end had to be suspended. In the face of this gloomy history, the authorities determined to put another tax weight on the struggling corporation, and that weight (chiefly on franchise account, bringing the Company's total tax to $37,500 per annum) was the one which could not be carried. The result is that the Directors, at the last quarterly meeting, having determined that the earnings for the quarter had not been sufficient to warrant the declaration of a dividend, and in order that the Company might have sufficient returns in view to warrant its usual prompt payment of running expenses, authorized the officers to increase the net selling rate per 1,000 to $1.45: an advance of 15 cents per 1,000. It takes quite a bit of courage in these days of "sham competition" to advance the price of a standard article that appeals to one's needs, especially when the the seller thereof is supposed to have his right to trade derived from the representatives of the public; but if the public will select representatives who betray rather than represent them, the public must take the consequences; and the consequence in this instance at St. Paul is that the St. Paul Gas Company must protect itself. It might have gone further, for during the life of its charter it is entitled to charge a rate quite in excess of $1.45, but its desire is neither to punish the over-exacting local authorities nor to oppress its patrons—it merely wishes to save itself. The real trouble in the situation is that its patrons will be obliged to shoulder some of the tax burden that properly and solely belongs to all of the residents of St. Paul, be those gas consumers or not. Under the circumstances, we believe all will admit that the Company has acted wisely and well.

MR. EICHBAUM'S PAPER.—The paper[1] by Mr. F. H. Eichbaum, of San Francisco, on "Reminiscences of Gas Manufacturing, and Kindred Matters," read at the July meeting of the Pacific Coast Gas Association, is a most readable account of that gentleman's experience in the gas business. In fact, it could not well be otherwise, for the author admits that in his earlier days he was something of a bookmaker, and bookmakers are adepts, or should be adepts, in getting together readable matter. No matter, however, what he was, he now is a very much respected member of the gas fraternity of the Pacific Coast, and as such we very decidedly object to the complete passing of his suggestion, "And, to come down to members of this Association, it is probable that not a quarter of those present engaged in gas making did not drift into this pursuit by the force of circumstances over which at the time they had no control." The sentence is a trifle involved, but we presume Mr. Eichbaum to mean that only one-quarter of the members of the Association were in the gas business on the Coast through youthful designing and subsequent equipment. For our part, we submit that such a statement might well be permitted to pass unchallenged a decade ago; but in the new decade, say beginning with 1895, we incline to the view that the percentage of those in the business on the Pacific Coast, whose *entree* thereto was rather from design than force of circumstances, is at least 50. However, whether Mr. Eichbaum is right, or that we are, in the instance noted, does not alter the fact that his "Reminiscences" are entertainingly readable.

NOTES.—Mr. Luther Hill, President of the Spencer (Mass.) Gas Company, has notified the proprietors of the Worcester and Suburban Street Railway Company that, unless the latter make suitable payment for damage done to the Gas Company's mains and services, because of electrolytic action, a suit for such damages will be instituted. The Gas Company puts its loss on the account named at $400.——Articles have been filed announcing the incorporation of the Camden (N. J.) Fuel Gas Generator Company. The objects of the Company are "to manufacture and sell all kinds of gas and oil generators." The incorporators are Messrs. J. L. Westcott, C. Hollinshed, W. W. Mines and A. L. Osgood.——The Key City Gas Company, of Dubuque, Ia., has petitioned for an extension of its charter for 25 years, from 1914.——The *Electrical Engineer* last week emitted a gruesome wail over the fact that the Government proposed, in the improvement of its property at Fort Hancock, Sandy Hook, N. J., to construct a gas works, for the complete, satisfactory and economical illumination of the buildings and lanes of the Fort. Our contemporary fears that the proposed gasholder may prove a target for the missiles to be projected from the guns of the proving ground, and so on; and so suggests an electric lighting plant, with storage batteries—if necessary.

1. See p. 244.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.]

FIFTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD AT SAN FRANCISCO, CAL., JULY 20, 21 AND 22, 1897.

FIRST DAY, MORNING SESSION, JULY 20.

The Association was called to order at 10:30 A.M., July 20th, by the President, Mr. T. R. Parker, of Napa, Cal., who said:

I am pleased to meet you, gentlemen, this morning, and to greet you with a hearty welcome. You were informed that our last meeting was in the nature of a "wake" over the remains of the old Howard street gas works, but out of the remains of the old ruin was made possible this beautiful building. This magnificent specimen of architecture is a credit to its designer and a satisfying pride to its owners. Let us hope that it may, in the same space of time, witness the same full measure of progress that came to its prototype, whose "wake" we, as gas men, attended. I think the directors and officers of the San Francisco Gas Light Company are entitled to our best thanks for their consideration for our comfort and convenience in the present instance, as well as in the past. You will consider that the Pacific Coast Gas Association's fifth annual session is open and ready for such business as may come before it.

On account of the large amount of business to be considered the reading of the minutes was dispensed with and the roll call postponed. The regular order was then taken up.

ROUTINE BUSINESS.

The Secretary—On behalf of the Association I addressed a communication to Messrs. J. B. Stetson and S. B. Cushing, of the North Pacific Coast and the Mill Valley and Tamalpais Railroads, asking for the free transportation for the members of the Association and its guests, to the summit of Tamalpais Mountain, on Thursday. A favorable reply from both these gentlemen extends to the Association the courtesy of their roads for that day. A number of interesting letters from Eastern gas men, sent in answer to invitations to them to visit the Coast, have been received. The writers include Mr. W. C. Boyle, President of the Ohio Gas Light Association; Mr. W. H. Pearson, of Toronto, Ontario; Capt. William Henry White, of New York; Mr. Charles H. Nettleton, President American Gas Light Association; Mr. James H. Armington, East Providence, R. I.; Messrs. A. B. Slater and A. B. Slater, Jr., Providence, R. I.; Mr. M. S. Greenough, Cleveland, O.; Mr. Eugene Vanderpool, Newark, N. J.; and Mr. Irvin Butterworth, Columbus, Ohio.

REPORT OF THE BOARD OF DIRECTORS.

The President called for the report of the Board of Directors, which was read by the Secretary:

SAN FRANCISCO, CAL., July 20th, 1897.

To the Members of the Pacific Coast Gas Association—Gentlemen: We submit herewith report of the Secretary and Treasurer for year just ended, with the recommendation that same be accepted and approved, all receipts and disbursements being correct and accompanied by vouchers.

We recommend that the following named gentlemen be elected to membership in the Association:

Beck, A. C., Oakland.	Hitzeroth, I. D., San Francisco.
Boardman, W. F.	Hollidge, Geo. H., Modesto.
Boggs, M. J., Colusa.	Kahn, Lazard, Hamilton, O.
Cardaff, Robert, Santa Cruz.	Kinney, G. I.
Davis, R. J. San Francisco.	Lowe, L. P., Pasadena.
Eichbaum, C. W., San Francisco.	Meston, M. C., Santa Barbara.
Glasson, John, Grass Valley.	Parker, W. M.
Grant, E. P., Modesto.	Poole, C. O., San Francisco.
Green, J. E., San Francisco.	Rice, A. I., Riverside.
Guldlin, O. N., Fort Wayne, Ind.	Wiedenthal, S. H., San Francisco.
Gutsch, A., Fresno.	

Resigned.—Decker, D., Fresno.

We further report that we have examined all papers submitted, and approve same, as contained in programme of meeting to be held, as suitable and proper to be presented. Respectfully submitted,

T. R. PARKER, } Auditing Committee,
JOHN CLEMENTS, } Board of Directors.

ELECTION OF NEW MEMBERS.

The report of the Board of Directors was accepted, as was also the report of Secretary and Treasurer Britton. On motion, the Secretary cast the ballot of the Association for the election to membership of the

gentlemen above named. Subsequently the new members were introduced to the Association by the President.

PRESIDENT'S ADDRESS.

Vice President Eichbaum at this point took the Chair, while President Parker read the following inaugural address.

[For President's Address, see JOURNAL, Aug. 9, p. 208.]

On motion of the Secretary, the President's address was referred to a Committee (E. C. Jones, John L. Howard and C. O. G. Miller) for consideration and recommendation; the Committee to report before the close of the meeting.

The Secretary announced the programme respecting the banquet and the plan for the outing to Mount Tamalpais, after which the President introduced Mr. John L. Howard, of San Francisco, who read a paper on

THE SPONTANEOUS COMBUSTION OF COAL.

[For Mr. Howard's paper, see JOURNAL, Aug. 9. p. 210.]

Discussion.

The President—Gentlemen, this very able paper is now before you for discussion. We will be glad to hear the experience of others on this interesting matter.

Mr. Eichbaum—Those of us who have been unfortunate enough to battle with this trouble do not care to recall their experiences, so it is enough for me to say, so far as my experience goes, I never knew a coal fire of the nature indicated to occur unless particles of wood, either accidentally introduced or in supports, first started the fire. Although I have known of 30 or 40 fires, I never knew of a case where such fires did not break out somewhere in the proximity of the wood. It frequently happens that coal is brought in Japanese baskets, made of grasses, which are about the nicest things to start a coal fire that I ever saw; so much so that when we received Japanese coal we were very careful to cull the baskets out. We found them sometimes on fire not over 3 feet below the surface of the pile. I do not know that I can say anything more to corroborate what Mr. Howard has said, who has covered the subject very fully in a practical way, and has given us, too, a scientific explanation of the subject. My experience certainly fully confirms everything he said.

Mr. Jones—It is not a reflection on the skill of an engineer to have coal fires. Most of the coal fires I know of occurred in large masses of coal, where gas companies were so situated that they were obliged to store large quantities. For instance, in Boston, where I had charge of the North End Station, we were obliged to store large quantities in the summer time in order to carry us in the winter time. Boston Harbor might be frozen over for weeks at a time. With a coal works of 100 benches of sixes, you can imagine the amount of coal handled daily. One precaution taken by the managers of large companies is the periodical cleaning out of their coal sheds from time to time; and as each cargo is brought in it is desirable, if possible, to place it in some isolated part of the shed, or where you can put your hands upon it at any time; that is, the newer coal will be stored in the most remote place, so that the old coal is constantly being used up and worked out. My experience in Boston was principally with Nova Scotia coals, Pictou and Lingan, which contained large quantities of pyrites, and I found fire as Mr. Howard said, under leaky hatches. Under each hatch there is bound to be a cone of very fine slack coal, and our experience with coal fires has been in such places, or alongside of wooden supports in sheds where there may be a draft of air. At the Boston gas works we took the temperature of the coal piles every Monday morning. The sheds were fixed with 2 inch vertical pipes extending to the floor of the shed, through the piles of coal, and it was a man's duty each Monday morning to lower a thermometer into these pipes and make the proper observations. It took him fairly the whole day to get the temperature of every part of the coal piles. By that means we were enabled to discover a rise of temperature in any part of the shed. Using such quantities of coal we were enabled to get at the heated portion and use it up without much loss to the Company. Before doing that we had to rely upon the odor of the gases coming from the coal fire, which is very peculiar—I suppose every man here in the house has perceived it at some time or other. A gas man always dreads it, for after one experience he can smell it and know exactly what he is smelling from one end of his works to the other. In the course of handling coal fires I have invariably gotten at the fire by shoveling. I find it is better to spend a good deal of money in a few hours than to drag on and work a very few men or a very few carts and give the fire headway. Whenever we have a coal fire at the station we work day and night at it, and with as many men as we can conveniently place. The surface oxidation of coal is of course constantly going on. The deterioration of bituminous coal is something like 10 per cent. a year; that is, coal stored for 365 days is worth only 90 per cent. of its original value as a gas producing agent. This loss of 10 per cent. is, of course, the effect of the oxidation on the surface of the pile; and, as Mr. Howard has said, the oxidation makes the coal friable. It breaks it up on the surface; but any heat generated is rapidly taken away by the air blowing over it.

The Secretary—Mr. Howard spoke of the dangers resulting from the oxidation of the coal adjacent to wooden supports, that we all have, more or less, in our coal sheds. We have a plan in Oakland that was devised by Mr. Eichbaum, if I recollect rightly, while he was our Engineer, and as we have never had any fires in the coals, I don't know whether such freedom is attributable to our practice or not; but it is well worth mentioning. We have a pipe system, similar to that mentioned by Mr. Jones, for ascertaining the temperature of the coal at different points, which runs from the foundation of the shed to the top. The pipe is perforated every 3 feet with a 1¼ inch hole—all the 2-inch cast iron mains that we had on hand we used for the purpose named. They have been for 15 or 20 years alongside every wooden support in our coal shed, and we have never had a fire. Does Mr. Jones consider that that produces sufficient cooling of the air to prevent this oxidation that produces the fire?

Mr. Jones—I hardly think it would. I think it is a case of very good luck.

Mr. Howard—I will ask permission to supplement my paper with one or two remarks which I did not think worth while to enlarge on. In the examination of this question I read considerable from the translation of papers, by Richters, a German, and by a French scientist and chemist named Fayol; and since I handed my paper to the Secretary, the Governor of New South Wales has appointed a Commission to investigate the probable cause of the ignition of a lot of coal in ships that were loaded at Newcastle, and largely bound for San Francisco. Perhaps those of us who are engaged in importing Australian coals will remember that within the last two or three years Wallsend coal and some other brands have taken fire. Vessels have been destroyed and some cargoes have come in heated. It may be interesting to know that one of the witnesses before this Commission was the Superintendent of the Melbourne gas works, where they seem to have two works. At one of them they have been in the habit of storing their coal 20 feet in height, while at the other they have not exceeded 14 feet. At the 14-foot depth they have never had a coal fire, whereas at the 20-foot depth they have had them, the same kind of coal being stored in each instance. With regard to remarks made by Mr. Jones and Secretary Britton, I would say that the conditions at our San Francisco coal storage depots are somewhat similar to those of the local gas companies. We never had a coal fire that the source was not in wooden trestle works imbedded in the coal, and we have had a number of fires. We have always found it useless to undertake to extinguish fire by water, and that is the conclusion also reached, as seen from the reports published in Europe. In the way outlined we have avoided fires altogether, and our plan has been latterly to put by itself the first coal that comes out of the ship. That contains all the fine coal which would cause a spontaneous fire on shipboard, if one did occur, and we have concluded it is vitally important to take that coal out of the ship, put it in the yard, and cover it over with coal which came from a different part of the cargo. By isolating the coal which comes out of the hatchway, and using it up first, we have not had a single fire since we have adopted that practice. I consider that is the best preventive that can be adopted by any company which stores bituminous coal.

Mr. Eichbaum—Some time ago the *Scientific American* and the AMERICAN GAS LIGHT JOURNAL printed an explanation of fires that occurred where a steam pipe passed through wood. In places where the temperature did not exceed 265° F., it was found that wood would catch fire. Examination by scientific men showed there was a partial combustion into charcoal, extremely slow, but nevertheless sure, and that conversion was the occasion of fires in the cargoes. The same thing occurs to a certain extent with wooden supports. I have examined wooden supports on many coal piles very closely, and they all seem furred, in a manner—charred by exposure—to a great depth of coal. In fact, they are like tinder on the outside, somewhat analogous to tinder made of unburnt rags. I believe the temperature at which that furry surface ignites is very low; very possibly 350°, perhaps less.

Mr. Howard—Is it not the self-evolved heat from the coal that does that?

Mr. Eichbaum—I have no doubt of it. It is hardly charcoal. It is a sort of furry condition, but it is very evident. In our works at one

time we were compelled, from lack of room, to store coal 32 feet high. As soon as we started that we had fires. Wood in almost every case is required to start a fire, and the higher you store your coal the more coal fires you have.

Mr. Holberton—If wood is the cause of this so often, I would like to ask why they do not put in more iron buildings? To my mind the danger of fires would make it well worth the difference in cost. As Mr. Howard said, there have been sheds put up recently at considerable expense, in which wood was used almost entirely. Is there any other reason for using wood than the diminished cost?

Mr. Howard—Coal fires happen on board ships where no wood is in contact with the pile.

Mr. Holberton—The discussion seems to show that it is more likely to happen with wood.

Mr. Howard—Simply because the wood ignites sooner and at a lower temperature. If there is no wood you will get the fire, but with wood you will get it sooner. If you are going to put in buildings it will be better to put in iron supports. It will avoid risk to that extent.

Mr. Eichbaum—A plate of ¼-inch sheet iron will answer every purpose.

On motion of Mr. Clements a vote of thanks was passed to Mr. Howard for his very able paper.

The Secretary, at the request of Mr. F. H. Eichbaum, of San Francisco, read the latter's paper on

REMINISCENCES OF GAS MANUFACTURING AND KINDRED MATTERS.

My first introduction into the manufacture of coal gas dates back to the year 1840, and, though it was of an unofficial character, it was extremely instructive and interesting, and probably contributed largely to my following the business of gas making in future years, under many plans, patents and processes.

I was articled, as the phrase goes, to a reporter in a Cathedral town in England, and my time was largely spent in copying laboriously articles for the London papers; practicing and learning shorthand, etc. The premises of my employer were not far from the lot that the gas works of the corporation which supplied the city were on, and my devoted chum was the son (about my age) of the manager of the works, who was learning the gas business, as I was that of reporting. I taught him all the mysteries of shorthand, etc., and he inducted me into the gas business, as far as he was able.

There was not much to learn in those days beyond the manual parts, as the attention of scientists had not been turned to gas making at that early day to any great extent, and it was a matter of the most practical sort. I well remember how the boss stoker briefly explained it in answer to my enquiries: "You puts the coal in the retorts and you gets gas in the gasometer," as holders were then called, because the gasholder was in most cases the only meter used to measure the amount of gas made.

It was the day of cast iron retorts and wet lime purification; you knew when you came near the gas works, by the wrecked iron retorts, cracked beyond usefulness, sometimes by too much heat, but oftener by long continued use.

Then, as now in California, where cast iron retorts have survived utter disuse to a larger extent than in any other part of the United States, the life of cast iron retorts was a precarious matter. They lasted sometimes a short time and sometimes had a long career of usefulness. I remember well, how, on some day of jollification, too much beer caused the burning of more than one retort, and the trouble that raged around the premises for a day or two. The setting of these retorts was a serious matter, and only confided to a few who made quite a mystery of the proper number of nostrils to be used in setting retorts and their location. As a full exposure to the heat of the fire was not to be thought of they were shielded, and received only the partial effect of the furnace. To some of my friends this is quite applicable to this day.

As to purification, it was not, as at present, conducted in large purifiers with dry lime and oxide, but two large cast iron vessels were buried in the yard, the cast iron covers level with the ground. The gas coming from the retorts went through a washer and was then passed to the bottom of one of these vessels which was supplied with the so-called milk of lime. Through the center of each cover came up a shaft made gas tight by a stuffing box. This shaft was geared with a bevel wheel into another, which was turned grindstone fashion by man power to agitate the lime and move the spent portions of it away from the gas inlet so the whole mass might do its work. As a great favor my chum and I were occasionally permitted to spell the men on this shaft, which at times was hard to start and keep moving. When one of the vessels was found to have been fully charged with sulphur, the gas supply was shifted to the other and the lime run off into a well from whence it was extracted by a laborious process. When this took place all the people in the vicinity to the leeward knew it, as the smell was something frightful, although said to be healthy and a sure panacea for some diseases, and thought to ward off many others.

This much in the way of a reminiscence of gas making at quite an early day, when books on gas making had not begun to be written, and when people who knew anything on any special subject were more apt to keep it to themselves as a trade secret than to make it public.

I well remember attending lectures on chemistry where the experiments shown in illustrations would not compare with those now shown to boys and girls of 14 or 15 years. These lectures I faithfully attended whenever practicable, and "blew" myself up frequently in the repetition of the experiments.

I should have stated that my career as a reporter was abruptly cut off by the failure of my employer to make his business pay and his departure for Australia, where he is now, or was, a politician and a statesman. After this failure, and the loss of quite a sum of money paid by my father as a bonus for the knowledge to be conveyed to me, I stayed at home for a while and went to school again until 1842. During this time I made several attempts to see the gas making going on in my own town, but no boys "were allowed;" and beyond the fact that the works were larger, but similar in all respects, I learned nothing. In 1842 I was consigned to the care of an uncle who carried on the book business in a town in the south-west part of the United States. While I was there I had an opportunity of seeing an entirely new gas works built from the foundation to the finish, and my uncle, being indulgent, allowed me to go to the works frequently and learn what I could without any other idea than that of gaining general information. It is enough to say that it was the same thing—cast iron retorts, wet lime purification and complaints loud and deep of the smell of the "Blue Billy."

In 1846, being my own master and not being fascinated with the book business, I went to Pittsburgh to learn the business of making steam engines, fire engines, and all sorts of machines. During that part of my life, beyond seeing castings, such as standpipes and retorts, made, I was too busy to learn anything about the making of gas, and in fact paid no attention to it until 1851, when I had some experience with the Aubin gas process, an apparatus by which very good gas was made from cotton seed and rosin. This process, from which much was expected, was at one time in use in San Francisco, as some of you may remember. A brief description of what I saw used and operated for a short time is worth giving.

This form of Aubin apparatus consisted of a number of cast iron vessels, similar to the bowl-shaped boilers used at present for cooking feed for stock, only not so deep, and provided with a seal or lute of soft lead and an outlet at the side on the top, next to the lead seal trough, which outlet was connected with a hydraulic main and the ordinary hydraulic seal. These pots or bowls were set in a furnace heated by direct fire of coal or wood from below, and, when hot enough to use, about at a cherry-red at the bottom, the lead in the seal trough being melted, a heavy cast iron cover was put over the retort, for such it was to all intents and purposes. The cover had a projecting flange or lip, about 2½ inches deep, dipping into the melted lead, and formed a very effectual seal. I may remind my hearers that this same appliance has been used in some cases to seal the superheater valve of the Lowe apparatus.

The material used in the Aubin gas works that came under my observation was cotton seed and rosin, both of which before the war were very cheap; the gas produced required only to be passed through a very simple washer, without any other purification to fit it for use. The candle power was good, and, although no coke was produced, the tar helped out the fuel for heating the retorts very materially.

About this time, long before petroleum had been discovered in any quantity—in fact when it was being brought down in small kegs holding about a gallon, from the headwaters of the Cumberland river, in Kentucky, and sold as a specific for rheumatism, and almost every other disease to which man is liable (I think it was in 1849 or 1850)—a wonderful machine for making gas without heat was brought to the town where I was engaged in building and repairing engines and machines of all descriptions. Some parts of this complicated machine, which had been built in France, had been broken in transit, and I was sent to repair it. It was fearfully and wonderfully made, probably to disguise and conceal the real simplicity of the machine. When the lights were opened and lit a number of wheels commenced to revolve

and a very handsome light was produced. The material used was benzol, a light naphtha obtained by the distillation of coal tar, and also extracted from the oil obtained by distilling the cannel coals of West Virginia, where may be seen, on the great Kanawha and its tributaries, the ruins of stills used for that purpose, now thrown out of use by the discovery of petroleum. These oils were sold at that time as kerosene or coal oil, at $1.50 to $1.25 per gallon. It was safe, and rapidly replaced lard oil, which up to that time had been the staple article for domestic illumination. As houses were not generally piped for gas, and the piping being very expensive, gas was introduced slowly.

I soon discovered how simple was the operation of converting air into a combustible gas, but as my business was in another line I only stowed away the item in my brain for future and more extended use in the future. This incident is useful as a reminder to those who are younger that carbureting gas machines, of which there have been two score at least, long antedated the light products of petroleum, at present called in this country "gasoline," and in England "petroleum spirit."

The right to manufacture and use this cumbrous and expensive machine was sold to a company that met with only moderate success. At that time the process of making barrels tight with glue had not been discovered, and the transportation of the extremely volatile benzol was dangerous and expensive. It is worth relating, and it is not generally known, even to those who have undertaken to write the history of petroleum, that, as far as I know, the first flowing well of petroleum that was ever bored, perhaps in the world, certainly in the United States, was struck, perhaps in 1848 or 1850, by Kentuckians boring for salt water about 50 miles above Burkesville, on the Cumberland river, or on a tributary of that stream, at the head of navigation. This well, as described to me by raftsmen who saw it in full operation, was considered a failure by the parties who bored it, as it produced only enormous quantities of an oil for which they had no use. It flowed a stream of oil for several days with great violence, and for months it flowed in a decreasing amount and accumulated in the eddies of the river far below Nashville, being set on fire by parties in the eddies. The marks of the tar burning on the rocks were plainly visible in 1854, and often referred to as showing that the river had been on fire.

I also had an interesting experience with making gas from pitch pine, called "light wood." The retorts used were the common cast iron ones, similar in shape, but smaller and shorter than those used for coal gas. The retorts were fired with wood and the charges were of fat pine, retorted until all the gas was driven off and the product stored in a holder, after being washed to free it of the tar which was used principally for fuel. The fat pine used was almost rosin, and was so rich that the process was simply making rosin gas from fat pine. The charcoal was of fair quality and helped out the fuel materially. The gas was good, and if such fat pine were obtainable now as then, many works now making coal gas would be using this means to-day.

This last experience is no novelty in California or Nevada; but as I am purporting to give reminiscences of my own personal experiences, and not a history of gas making, I must be permitted, without criticism, to relate what I have seen and operated myself, although I have not mentioned some other interesting matters which did not actually come under my personal observation. I am rather sorry that this paper has necessarily assumed almost the form of a biography, and I hope to have the indulgence of the Association for its having taken this shape. Its being so is not without some compensating value, as it shows the utility and advantage of literally picking up useful information whenever practicable, no matter if at that time it would seem to be useless. No man starting out in life knows or can know what Providence or society may call on him to do. The man educated as a chemist may become a lawyer and be particularly successful as an expert in legal chemistry; the machinist may come to be a civil engineer, and be so much the more useful; such instances might be multiplied *ad infinitum*, and to come down to members of this Association, it is probable that not a quarter of those present engaged in gas making did not drift into this pursuit by the force of circumstances over which at the time they had no control.

Having brought my reminiscences up to the time of the civil war, I shall conclude for the present, promising at a future time, *Deo volente*, to resume them, when the rise of petroleum gas and the experiments connected therewith will be found of great interest.

Discussion.

The President—This has been a kind of home thrust to a great many of us going into the gas business. I believe a great many of you could recite early experiences parallel with those of Mr. Eichbaum. Mr. Clements, cannot you entertain us a little in relation to your introduction to the gas business?

Mr. Clements—After the very able paper of Mr. Eichbaum's little is left me to say. At the time of Mr. Eichbaum's earliest reminiscences I was on some other shore. As said in the paper, I am not sure but that his remarks relative to going into the various pursuits of life have been applicable to more than half of the members here assembled. I started, apprenticed by an English father, in the trade of machinist. I have been a merchant. I have filled public offices both in the nation and in my own home; and finally, by force of circumstances, was compelled to take hold of gas works. I have no regret that circumstances brought that about. I have been quite as successful in that as anything I have ever undertaken. I have had some experience in making gas from pitch wood; in fact, there was a time in our section of the country when we could get plenty of the "pitch," as we call it, and it makes a very good gas, although it is somewhat difficult to purify. At the present time the wood is growing scarcer, and we are no longer using it. I don't know that I can say anything more. I was very much pleased with Mr. Eichbaum's paper, and I am satisfied it will be an advantage to the younger men when they read it published in the JOURNAL. They will read it and reread it.

Mr. L. Kahn—Mr. President, you invited strangers to comment upon the papers read here, and I propose to avail myself of the invitation. Although my home is in Hamilton, Ohio, I may not be so much of a stranger as the distance from San Francisco seems to imply. I have been overwhelmed by hearing the paper of Mr. Howard, and by learning since I have been here of the extraordinary high prices that prevail in this market for coals. I am also reminded of a trip that I made not long ago to Mexico City, in connection with which trip I brought with me a little Bunsen burner, for the purpose of making a little improvement, if I could, upon the management of the Gas Company at Mexico City; and (pardon me for stating this fact which is not relevant) I found there, sir, that they were making gas out of wood. I am not aware that I am stating a novel proposition to you, but Mr. Knight, who has been in charge of the gas works in Mexico City for a large number of years, I think he said some 40 years, told me that they were making gas out of wood. Mr. Knight is an Englishman, and the gas works is owned by Englishmen. Now, in view of the fact that you have the greatest timber country in the world close by you, it seems to me there is a wide and vast field for the employment of the talents of your chemists, for the purpose of determining whether it is possible or not to make gas from some of the woods you have, and thus do away with the troubles that you are having in the matter of burning cargoes and coal fires, and possibly with the high prices you are paying for coal.

The President—So far as my experience goes, the woods of this State are not sufficiently charged with carbon, in the shape of resin or its kindred substances, to warrant their transportation to points where they could be used for gas making. Seeds have been found more useful, but the trouble is that the residuals from seed amount to nothing. In Marysville we used castor bean for quite a time, and the product therefrom was a very beautiful gas. It needed very little purification, but the residuals amounted to nothing. I understand that pomace from the grape has produced not only a good gas but also a coke or fuel to maintain heats in the furnace. I have had no experience with it, but believe Mr. Jones can say something to us in that respect.

Mr. Jones—My experience has been only through the kindness of Mr. Meyer, who has been making gas from pomace. Its cost to him is very little money, for during the wine season he gets a sufficient quantity to run his works for three or four months in the year. This is an especially satisfactory fuel, as it yields a fine grade of charcoal which I should think might be used for printing purposes as it is practically pure carbon. I am sorry Mr. Meyer is not here to tell us something about it.

On motion of Mr. Clements, a vote of thanks was passed to Mr. Eichbaum for his paper.

The President then introduced Mr. G. I. Kinney, of San Francisco, who read the following paper on

THE WELSBACH LIGHT.

Gentlemen—In submitting a brief paper to the members of this Association, upon the subject of the Welsbach light, I know that I am introducing a topic with which most of you are already very familiar, and possibly have somewhat divergent views as to its position in the field of artificial lighting. I will not attempt to speak other than from my own observation and experience with this light, and I shall dwell principally upon some few details in regard to its installation, that I have found quite important for its successful use.

It is now commonly observed that the Welsbach light is proving a good "educator" in the way of training people to use a better light, and more of it, than they have been accustomed to in the past; and I have yet to find the person who has used this system successfully that was content to return to the old method of illuminating.

With the present improvements in this light, it is much easier managed than were the older styles, and if it is not giving excellent results it must be from lack of proper installation or intelligent use thereafter, in which case there is usually one complaint about the burner, and another about gas in general for illuminating purposes.

In order to give the consumer a satisfactory service of any kind, a clean gas of fairly uniform quality comes very near being a necessity. I have met with some few difficulties in several places, where the gas companies donated a liberal allowance of tar and other by-products to the consumers, and delivered the same through the gas pipes. However, I have found no more trouble with Welsbachs under those conditions than occurred with the ordinary tips. In the former case care was required to avoid smoked mantles, and in the latter frequent changing or cleaning of tips was necessary.

In case of a smoked mantle, from this or any other cause, usually by seeing that the burner is clean and then turning the light to about one-half its normal power, the soot will soon burn off and disappear, and the mantle is always good until too badly broken for use.

We will now assume that we are using a good, clean gas, and as each member of this Association who attends its meetings makes better gas than any of the others, it will not be difficult to find.

One of the first requisites for the successful use of the Welsbach light is to have as near a uniform pressure of gas as possible. This may be sufficiently so if the gas mains are large and the output regular, but when this latter condition is not the case, a good pressure regulating device is essential. Where many lights are used, or where a low pressure is most desirable, a good mercury-sealed governor at the riser will do the work satisfactorily. If but few lights are used, or in case of a fuel supply from the same meter, each light should be equipped with a suitable volumetric governor.

I have obtained the best results from the No. 34 lights, with from 8 to 14-10ths pressure, and on the Nos. 33 and 35 lights from 12 to 20-10ths pressure. This was, of course, where governors were used at the risers, and on gas that did not exceed 20 candles.

As to the amount of gas to use, briefly speaking, use as little as possible and give the proper light. In adjusting the holes in the checks it is well to have them no larger than to give a flame that sufficiently fills the mantle to make a bright incandescence to within about three-quarters of an inch from the top; that is, when the lamp is first lighted. After it has been burning a few moments, it will show a bright incandescence to within one-quarter or one-half inch from the top of the mantle, and a much better quality or color of light will be produced than if more gas is used. This will also prevent the overheating and bending of mantle supports. With the lights adjusted to burn thus I have found the gas consumption with manufactured gas to be as follows: The No. 34 light will burn from 2.4 to 2.8 cubic feet per hour, and the Nos. 33 and 35 lights from 2 to 2.3 cubic feet per hour, according to the kind and quality of gas used.

Now, all this question of pressure and proper gas supply can be settled to a sufficient extent with the key on the fixture; but I have not found one person in twenty that will do so. And as this matter has a most important bearing upon the life of the mantle, as well as the amount of gas used, it is the best general practice to use proper automatic regulating devices where gas pressures are variable.

By these adjustments when the lights are installed, and with simply ordinary care thereafter, the trouble with mantle and glass breakage, smoking, unsteady and discolored lights, and other troubles will be eliminated to the greatest extent.

With the proper adjustment of pressure and supply, by turning the gas on full and holding the match or taper several inches above the top of the chimney, the burner will light with but very little explosion. By many it is claimed that this explosion is the chief cause of mantle breakage. While this may be true in a measure, it is my opinion that a variable pressure and supply of gas, and the consequent continual expansion and contraction of the mantle, will have fully as much tendency to disintegrate it as the former cause.

The use of a by-pass with a small pilot light inside of the mantle is a very convenient arrangement, and also prevents any explosion in the lighting. This is also the case where electric igniters are used.

I have found it a very good plan to use the mica chimneys when the lights were placed subject to more than ordinary breakage, and many use them exclusively in preference to glass.

My experience with mantles for several years has been that they have averaged about the same as to durability, but the product of this last year seems to exceed all others in the matters of gas economy and quality of light.

I have kept account of several thousand lights, as to the life of the mantles, and found that they lasted about 8 months without renewal. A better result would probably be obtained by a good system of inspection, which I had not adopted. I have also found a very great difference in the condition of new mantles, as to how they were shipped; and have had but very small loss when they were sent by freight and handled as little as possible in transit.

When a mantle is renewed, it is always best to see that the lamp is thoroughly clean, especially the wire gauze tip, as a corrosion or clogging at that point will affect the candle power and quality of light very materially.

I have found it a very good plan, when lights are placed, to explain to the customers the general principle and simplicity of the burner, and to give them careful instructions as to how it should be used. This usually gave them confidence in the light from the start, and proved a decided advantage to both dealer and customer.

We all know how rapidly this light has grown in popularity the last few years, and, although a small gas "consumer," it has done much in the interest of gas lighting.

Many gas companies have acted wisely in aiding the gas stove business to its present growing popularity, and it has been accomplished only by their taking the matter in hand, either directly or indirectly, and intelligently and persistently pushing it; and, in these times of rapid progress, the enterprising public are not content with anything but the best and most economical service possible, and it behooves those interested in gas manufacture to use every means to increase its efficiency and popularity as an illuminant, as well as for fuel.

In many cases there may be little to improve upon from the retort and generator to the consumers' meters, but beyond that are many places where there is an opportunity for that consumer to get better results by the intelligent use of the best appliances. This "education," if I may so call it, can best be directed by gas manufacturers themselves, and the method of pushing the fuel business has been one good step in the right direction.

In conclusion, I will say that it is being demonstrated beyond all question that this system of lighting, when used properly, has given a most satisfactory and permanent result, and any burner that will take ordinary gas and produce over 20 candles per cubic foot must continue to grow in public favor, and to foster a demand for a greater amount of light, and its measure of success will redound to the benefit of the lighting industry in general.

When Mr. Kinney had read his paper, a motion to adjourn to 1:30 P.M. was adopted, the understanding being that the paper by Mr. W. W. Gillespie, of San Francisco, which was on a topic similar to that presented by Mr. Kinney, would be read first thing after recess, when a joint discussion on them could be had.

First Day—Afternoon Session.

On reassembling, Mr. Gillespie, who explained that the title of his paper was

INCANDESCENT GAS AND ELECTRIC LIGHTING: A COMPARISON,

instead of "The Value of Small Gas Bills," as printed in the official notices, then read as follows:

It is doubtful whether there has been any invention in the nineteenth century of greater importance to people engaged in the manufacture and sale of gas for illuminating purposes than the invention and introduction of the Welsbach incandescent gas light.

When electricity as a means of illumination entered the field as a competitor against gas, those engaged, both in the manufacture of gas and also interested from a financial standpoint, became greatly alarmed lest electricity would supersede gas as a means of illumination, and they had good reason to feel somewhat uneasy.

Electric lighting being a new thing in the line of progress, this new means of illumination was naturally taken up by the consumer, often at an increased cost over old methods of lighting by gas; for upon the introduction of the arc light the prices charged for service were quite high, and, owing to its uncertainty, the same was not altogether satisfactory. Electricity being a new factor in the lighting business many bright men, and especially young men ambitious to make a mark in the world, turned their attention and talents to the study and introduc-

tion of electricity in the various forms in which it is now applied, with the result that great progress has been made in apparatus devised for the generation and control of current used for electric lighting purposes. Following the introduction of the arc electric light came the incandescent electric light, which made possible subdivision of the current and a better distribution of the lights throughout places to be illuminated. By this means they were enabled to further attack the gas industry in places where it was first thought impracticable.

The electric lighting business becoming very extensive, large stations equipped with the latest and most improved apparatus for the generation of steam, motive power and electric current had to be erected. Supposing that the business had a great future, it was not difficult to get financial assistance with which to establish many of the large electric lighting stations now in existence.

With the most improved and modern apparatus installed for the operation of an electric lighting station, the prices charged for current have been greatly reduced, and in some cases, through sharp competition by electric companies competing for business, the prices have been reduced to a figure at which it is impossible to furnish current at a profit. All this advancement, followed by a reduction in the prices of electric current, has had an apparent tendency to injure the gas industry throughout the country; but while the electric people have been making such great strides, those engaged and interested in the gas industry have by no means been dilatory. Many of the leading gas companies realized that, to compete successfully with the electric lighting business, they must remodel and in many cases almost wholly rebuild their entire works, adopting the latest and most improved apparatus for the manufacture of gas, in order to distribute it to the consumer at a price that would enable them to occupy a place in the field from an economic standpoint, and not be compelled to step aside by reason of the new illuminant. To this end the manufacturer of gas had to resort to every known device that the consumer should have the most efficient service at the least possible cost.

Foremost of all has been the Welsbach incandescent gas light. Not only does it enable consumers of gas to obtain a superior light, but at less cost as compared with electric light; the light furnished being perfectly steady and wholly within the control of the consumers, who are not exposed to those uncertainties connected with the service of electric lighting, where you are depending wholly on the efficiency of a dynamo, a steam engine, or of a single wire carrying current to the point of distribution. It is very seldom that you cannot get a steady supply of gas. If there is any likelihood of serious trouble the consumers usually have sufficient warning that there is something wrong, which gives them an opportunity to rectify the same.

Much can be said about the superiority of the Welsbach incandescent gas light over any other method of burning gas for illuminating purposes.

The Welsbach light not only furnished the gas people the means with which to successfully compete with the electric light companies, but to furnish a more efficient service at a much less cost. The Welsbach lights have displaced thousands of electric lights throughout the country, and have placed many of the gas companies in a position to defy the electric lighting companies, when not many years ago they were wondering to what use they could put their gas works, and it was supposed that the only way they could recoup their decreasing business taken from them by the new rival was to spend their energies in the introduction of gas for fuel purposes.

While it may be said that the extensive introduction of the Welsbach lights will reduce the consumption of gas, which may be true in a measure, it is taking that business from the electric lighting companies which the gas people could secure through no other medium, or in holding business for which the electric light people cannot successfully compete, on account of the low price at which it is furnished and the regular prices at which gas is sold by the gas companies.

It can truthfully be said that the electric lighting industry received a most serious blow when the Welsbach gas light entered the field as a competitor, and it has had a tendency to retard in a measure the progress of the successful operation of electric light stations in many places, and has caused people to become a little timid about furnishing capital with which to establish or to enlarge electric lighting plants. There is a tendency rather to invest their money in the gas industry, which a few years ago they were afraid to touch.

Much attention has been paid within the last two years to the manufacture and introduction of handsomely painted and decorated shades, globes and stands, and other devices to be used in connection with the Welsbach lights. The taste of the most fastidious can be suited, as there are many beautiful things, manufactured and sold to be used in connection with the lights, which greatly improve their appearance and efficiency. Recently a system of electric gas lighting for Welsbach lights has been brought out which is quite successful; also the electric by-pass, which is something just placed on the market. This, with the pendant and automatic burners, enables the consumer to control the entire gas lighting system by simply pressing a button.

One great argument used by the electrical people is that electricity can be handled so much more easily and conveniently than gas, but if the consumer of gas will only go to the same expense usually incurred in fitting places up to burn electric lights, they can have equally as convenient service, as there are many devices manufactured which successfully control the burning and distribution of gas, but which are seldom adopted by the consumer; in fact, few consumers know that such devices are in existence.

Much can be said with reference to the maintenance and installation of Welsbach and other gas burners. Often they are placed on the fixtures, and that is the last there is done with them until something goes wrong and they need repairing or overhauling. Seldom does any person familiar with the operation of these attachments or devices ever examine them until compelled to do so by reason of their impairment. The result is consumers often become dissatisfied and condemn many things which are meritorious, whose unsatisfactory service arises from lack of attention.

In the electric lighting business, skilled men are continually out examining and inspecting their lighting system, to keep the same in order to supply their customers with a satisfactory service. Those who are familiar with electric lighting, and no doubt many members of this Association are, as they have electric plants connected with their gas works, know of the many mishaps that occur in the station and in the distribution of current to their consumers, which is often explained away by stating that something broke down in the engine room, the dynamo burned out, or became short circuited, or there was a cross, or trouble on the line, and all sorts of similar excuses. Incidents of this kind seldom occur in the manufacture and distribution of gas, and if everything is carefully attended to, and the many devices utilized to furnish the most efficient service possible, there should be no room for complaints.

In the care and maintenance of the Welsbach lights in San Francisco there has been inaugurated a system among the large consumers of calling every day, examining the lights, rectifying any trouble that may exist, and making repairs if any be necessary. We also have postal cards printed, leaving blank lines upon which may be written any complaint or orders for repairs needed for the lamps, and all that is necessary is to mail this card and the wants of the users are fulfilled. For the purpose of rendering a more efficient service we have caused the men employed in placing lights and making repairs to wear caps and badges with the words "Welsbach Gas Lights" on same. By this means of identification users of lights may know the workmen and can call them in to their places of business or residences to put their lights in order, or do anything that is necessary to the lights. One other great advantage is they are admitted to residences to make repairs when without some such means of identification they would not be admitted. In addition to this it is an advertisement for the lights and gives the lighting business by Welsbach burners a prominence and an air of stability.

People very often look with disfavor on many of the attachments and devices used or sold by unscrupulous fakirs for the purpose of giving a better or cheaper gas lighting service, from the fact that they have been disappointed so many times. There are many useful and meritorious devices that are of great convenience to gas consumers, which if adopted would bring the use of gas into greater favor.

With the many improvements that are being made in apparatus used for the manufacture of gas, which greatly reduced its cost of production, besides furnishing a better gas, the novel apparatus and devices that may be adopted for handling it, and the most important factor of all, the Welsbach incandescent gas light with which to burn same, furnishing a most efficient and brilliant light at a moderate cost, the gas companies have little to fear from competition with electric lighting companies which are carried on legitimately for profit.

Discussion.

The President—Gentlemen, the ideas presented by Messrs. Kinney and Gillespie are very interesting, and ventilate the vehicle by which the light was introduced. Many are present who have had experience in that line, and whom we would like to hear from.

Mr. Ewing—I am very glad indeed that so much is being said and done with reference to the Welsbach light, and particularly in respect

of examining closely its merits. Let me speak reminiscently for a moment. Ten years ago about this time Mr. Emerson McMillin, in calling my attention to a new gas light that appeared in Germany, said it was the expectation to send a party over to Germany in order to investigate the light in the interest of the United Gas Improvement Company. I thought it was a very singular thing to send a man to Europe merely to look at a gas light, when the burner or light might just as well be brought here and investigated ; but, as we see now, it is a very wise thing, when you want to know anything about any particular kind of product, to go where the product emanates. The investigator went to where the Welsbach light emanated and subsequently came back with his report. The result of this was the beginning of the manufacture of the Welsbach light by the Welsbach Light Company, in Gloucester, New Jersey. Shortly after I asked Mr. McMillin what kind of a light he would recommend for the lighting of a church, and he said he thought the Welsbach was superior to all other lights for that purpose. I told my people we had better try the new light, but they said they didn't want any new-fangled arrangement, and consequently the lights I had ordered from Mr. McMillin I had to throw back upon his hands, tendering him the price of the lights for his trouble. He said he was very glad I did not use the lights, because he wanted them himself. For a little while the Welsbach passed out of my mind as it were, but some four or five years ago it began to glow and shine wherever gas was manufactured. Then we came to look into its merits, not with the expectation of ever becoming connected with the Welsbach Light Company, or the Welsbach Commercial Company, and to my great surprise I found something that was going to get around and ahead of electricity, which it was professed would be the light of the future. While I do recognize the fact that electricity is and must be the light of the future continually, and it has its field, yet it cannot usurp the field to the exclusion of gas, as utilized in the use of the incandescent gas light. And so I think I have before me to-day numerous witnesses who will testify to the fact that the Welsbach light has been a very great blessing to the gas industry, and has not only been so, but is now and will continue so to be. I feel that in being among you, as I have been for the last couple of years, that, in a very small way, without taking to myself any credit, I have been able to render you some benefit with reference to the furnishing of these materials and these lights which have enabled you to keep pace and hold your own as against electricity. I recognize the fact as well that some of you who are interested in gas, and perhaps most of you, are also interested in electricity. I also recognize the further fact that your minds are sufficiently broad to know that neither one nor the other can be crowded out, but that each will occupy its proper field, and that each will continue so to occupy it, and that each is benefited by the rivalry produced by the other. Therefore, I feel that this discussion with reference to the Welsbach light is beneficial, and call your attention to the fact that our Company is doing everything that is possible to do to further your interests and to perfect our light, and while we are benefiting ourselves we are bringing benefit to your doors too. I feel that in this discussion I would be glad if you would discuss this matter to its fullest extent, and if there is any question which you would like to ask that I am able to answer it will be more than a pleasure for me to reply. At my suggestion Mr. Kinney has been working up some matters of demonstration here with reference to the application of electricity to igniting lights. He would be pleased, when it is your pleasure, to show you whatever he has been able to bring about in the little machine which you all see before you. We want to do everything we can, gentlemen, to make your stay pleasant with us here, and all you have to do is to draw on us to the fullest extent, and I shall be glad to honor your drafts, in hospitality or otherwise. (Applause.)

Mr. Summers—In relation to the matter of street lighting with incandescent lights, I believe at present there is very little done in the United States in that line, but a few works in the East, and especially suburban works to large cities, where they have handsome boulevards, are starting this, and as far as they have gone have been very successful. I recently saw some in New York. They looked very nice, and the Superintendents of those works told me they were very satisfactory. I was rather surprised that they could put out these valuable lamps in the street without having them stolen or broken, but in these places where the residents are the better class of people they seem to have no trouble in that regard. The principal drawback to the Welsbach light as a street light comes from the stopping of the holes in the Bunsen burner by spiders. It is proposed to remedy this by gauze around the burner, or by tarred rags wrapped around the lamps, but these suggestions have not been tried long enough to determine their value.

The President—In my experience with regard to street lighting by Welsbachs, through the indulgence of the City Board we succeeded in getting two streets in Napa that were lit by the arc light. We substituted the Welsbach lights, placing them within 300 feet of each other. I looked at it from a biased standard, but judging by statements of people who frequented those streets they were better lit, one light blending with another, so that the street was more uniformly lit from one end to the other, than where the arcs are at a long distance, situated as they are in Napa, from 600 to 1,000 feet apart. There is bright light in the immediate vicinity of the arc, but intense darkness intervening. With the Welsbach you could see all along the avenue, and where the streets are lined with the trees, such as is the case in Napa City, it was a grand improvement, and we received a great many encomiums from the citizens there. So it may possibly be that this thing will recommend itself to the interior towns.

On motion of Mr. Clements a vote of thanks was tendered Messrs. Kinney and Gillespie for their very interesting papers.

The President announced that, in the absence of the author, who was detained at home through pressing business, the paper by Mr. John Kempf, Jr., of Salt Lake City, Utah, entitled

CHANGING A COAL GAS SYSTEM TO THE USE OF NATURAL GAS,

would be read by the Secretary. Secretary Britton then read as follows :

Mr. President and Members : During the fall of 1894 the City Gas Company entered into an agreement with the Natural Gas Company to supply Salt Lake City with natural gas, the Natural Gas Company owning and controlling the natural gas wells, situated 13 miles north of the city, the City Gas Company owning the coal gas plant, mains, meters, etc., in the city.

The City Gas Company furnished and laid complete a 6-inch lock joint, steel pipe line from the gas well to the City coal gas plant, and made all connections of gas wells with main pipe line in the gas field, and, at the City plant, put in valves, gates, regulators, etc., for controlling and reducing the natural gas from high to low pressure suitable for distribution in the city mains ; the Natural Gas Company to furnish the gas and the City Company to distribute the same.

The high pressure main pipe line was laid during the winter of 1894 and 1895, all connections being completed by April 1st, at the wells.

Our next move was to put the natural gas into the mains that were distributing coal gas to our consumers without loss, trouble or inconvenience to them. This was accomplished by dividing the mains of the city into a number of districts, by putting valves and gates in them, cutting them in two and plugging the ends until the natural gas was turned into them, when the plugged ends were reconnected.

Some new mains were also laid, connecting the natural gas regulator with the districts. Having completed the subdividing of a part of the city mains, a small low-pressure regulator was connected with the natural gas main line, and to the first city main district. This district contained several thousand feet of mains and 15 consumers. The natural gas was turned into the district through the small regulator, which was adjusted to give 3-tenths more pressure than was on the coal gas. This gradually drove most of the coal gas out of district No. 1, when we closed the gates that connected it with district No. 2. District No. 1 was left complete on natural gas for several days, when district No. 2 was filled with natural gas, by opening the gates between districts Nos. 1 and 2, and closing those which connected it with other districts containing coal gas.

District No. 2 contained a large number of consumers who were using the coal gas for cooking, heating and lighting. When the natural gas was turned in there were some complaints from parties who had failed to heed the notice of the time when the natural gas would be turned into their district. These complaints were mostly in regard to light. The natural gas, burnt through a common lava tip, would give little light, and when turned on full it would blow out. The most successful burner through which it could be burnt for light was the Welsbach lamp. As these could not be handled for less than $2.50 each, it caused the consumers to complain for a short time, until they realized the difference of having a light of 25 to 30-candle power through a Welsbach lamp, with natural gas at 50 cents per 1,000, in place of 18-candle power coal gas through the common lava tip.

I need not tell you the difference in the light given by the Welsbach lamp compared with the lava tip, nor of the difference in the amount of gas which each passes per hour, and a still greater difference of paying $2.20 per 1,000 for coal gas, or 50 cents per 1,000 for natural gas. So you will readily see that these complaints subsided.

So far, with the first two districts on natural gas, we had little trouble; these were governed by the small regulator.

With the turning of natural gas into district No. 3 the large regulator was brought into use, the small one being shut off, leaving the large regulator on the three districts. This large regulator is in duplicate, so that, in case of trouble with one, the other can be used. With the turning on of district No. 3 the commercial consumers were reached with natural gas. Here a number were consuming coal gas for manufacturing purposes, using Bunsen burners and blow pipes in their work. With the natural gas no heat of any consequence could be obtained through the burners used with coal gas—if the blowpipe or blast were used on the natural gas it would blow out; but by using a special burner with pilot lights attached thereto to keep the natural gas lit, a better heat was obtained than had been with coal gas. Also, in some cases, an alcohol torch was used as a pilot light in conjunction with the blowpipe or blast and natural gas.

The city main pressure on the natural gas was kept at nearly the same pressure as had been on the coal gas, the coal gas pressure being 25-10ths, and the natural gas pressure in the city mains, 30-10ths. Later on, when the entire city was on natural gas, the pressure was increased slightly for a short time, while burning gas under steam power boiler.

Of late, since using the gasholder as storage for natural gas, the city main pressure on the natural gas is the same as was carried on coal gas—25-10ths. With a pressure the same as carried on the coal gas, the same meters, governors, etc., were used. In most cases the stoves, ranges and heaters worked nearly as well with the natural gas as they had with coal gas; especially was this so where the gas and air mixers could be regulated. In some cases burners had to be changed, while in some ranges, stoves and heaters, the regulation of the gas and air mixer was all that was required.

One district after the other was filled with natural gas and the coal gas shut off from them; and the coal gas benches, one after another, were closed down, until November, 1895, when the entire city mains were distributing natural gas where coal gas had previously been supplied.

The natural gas flowed smoothly until January 1, 1896, when severe cold weather froze up some of the smaller pipes that connected the wells with the main line. This caused a partial failure of natural gas and caused us to fire up our coal benches in a hurry, only to let them down a few days later.

Owing to the soft formation in which the gas is found here, the wells frequently choke up and have to be re-opened and rapidly exhaust, making the supply limited and uncertain to depend upon; so much so that, after several partial failures, the coal gas benches were fired up and let down, until, in November, 1896, when the coal benches were heated up and have been kept up since, making some coal gas that is mixed with the natural gas, thereby securing our consumers against any more failures that may be caused by a deficiency of natural gas.

Discussion.

The President—This paper by Mr. Kempf discusses one of the wonders presented to humanity. Surely the First Cause of all, although making man in His own image, would find at this late day that there are a few following His example; that is, the manufacture of gas. Mr. Kempf shows the difficulties encountered, and also the accommodation to the needs of humanity. Looking at those here present, in the attempt to discover someone on the Coast conversant with the conversion and sale of natural gas, I am led to call upon Mr. Henry Adams. Knowing that natural gas exists in his neighborhood, we would like to hear his experience in the matter.

Mr. Adams—The Company which I represent controls the output of 13 wells in San Joaquin county. We distribute natural gas through one set of mains, sending our coal gas through another set. We charge $2 per 1,000 for lighting and $1.75 per 1,000 for fuel on account of coal gas supply. For the natural gas we charge $1 per 1,000 for the first 1,000, with a declining scale for larger consumption, down to 50 cents per 1,000 for gas used in engines. We have quite a large sale for the natural product. The natural gas will not burn in an open flame burner. We have experimented at length in respect of burners. With a gasoline burner the gas yields a fair result, but it does not give a good light unless it is used in the Welsbach, of which I think we have something like 6,000 in use in our town. There are a number of privately owned gas wells. The State Insane Asylum does its lighting and cooking with natural gas. The flour mills use it also, and a large volume of natural gas is used for gas engine purposes.

The President—Does Mr. Adams use natural gas under his boilers?

Mr. Adams—We use some in that way. We have burners fixed so as to use it rather than let it go into the air.

The President—Do you know how many feet of natural gas will be equal in fuel result to a ton of coal?

Mr. Adams—From 39,000 to 41,000 feet.

The President—That is, good steam coal?

Mr. Adams—Yes, sir.

A Member—Do you not use the gas under the benches?

Mr. Adams—We use some under the benches, as under the boilers.

The President—Can you give us any idea about the depth of the wells and their numbers? Are there any indications that suggested it, or was it stumbled on by accident? A great many of us feel interested in that.

Mr. Adams—Parties organized in opposition to us to see what they could do. An artesian well was bored by the city in the sixties, which gave out some gas; afterwards they bored to a depth of some 2,000 feet, and obtained a good supply of gas. Then residents in the immediate neighborhood did the same thing, and, finding we had quite a good sized opposition, we bored. We now control 12 or 13 of the wells, and there are 4 outside. We are still in the gas business.

The President—What is the pressure of the gas coming from the wells per inch?

Mr. Adams—About 42-tenths; 45 is the greatest pressure we have had.

The Secretary—Is the gas always accompanied by a flow of water?

Mr. Adams—Yes; and it is salty below 1,600 feet. Some artesian wells, only 900 or 1,000 feet, were bored, in all of which the water is brackish. We find that the water below 1,700 or 1,800 feet is about 90° F., and much of it is used for bathing purposes. We have some wells that give water of that temperature, and we provide bath houses for our customers.

The President—We would like to hear from Mr. Jackson, of Sacramento. I understand he has had some experience in the matter of natural gas, or gas wells.

Mr. Jackson—Mr. President, we have never had any suspicion that there was any natural gas about Sacramento, except that which emanates from the Legislature which meets there occasionally. A man from Stockton came there, who bored and bored and kept his mouth locked and did not say a word, but bored into us. We have been bored into by two long distance transmission companies—the electric transmission power from Folsom, and also from the South Yuba, who hurt us a good deal. We went into the Welsbach lamp business, placing 3,000 or 4,000 of those, and did a good business, until they kept cutting the rates of electricity. Mr. Ewing understands where we are now. We do not sell very many Welsbachs. We think possibly natural gas is there. We do not know what we will resort to if they spring that on us. They say they have a flow of gas; perhaps they have.

The President—In most cases natural gas discoveries seem to have been accompanied by the discovery of salt water wells. In a place back in Maryland, I think, where an early demonstration of natural gas was made the finding was in the neighborhood of salt water wells. The same experience seems to have been gained at Salt Lake, and, as Mr. Adams says, at Stockton. I am naturally interested in the thought that we might have natural gas at Napa, not enough to bore a well myself; but in the neighborhood of our city, thinking we had discovered a deposit of kaolin or fireclay, I forwarded a specimen of our discovery to Mr. E. C. Jones. Putting it to a microscopic test he found that we uncovered a cemetery of marine creatures that are connected with salt water—that is, their home would naturally be salt water; showing that the Napa Valley at one time was the bed possibly of an arm of the sea. It may be that we are over a reservoir of natural gas. As others may find themselves in the same position it may be well to take time by the forelock and institute experiments.

On motion, a vote of thanks was passed to Mr. Kempf for his paper.

The President introduced Mr. Thomas D. Petch, of Eureka, who read the following paper on

THE MANAGEMENT OF LIGHTING PLANTS IN SMALL TOWNS.

In presenting to this Association a paper on the management of small lighting plants, I am fully aware that the subject is not new to most of the members, especially as it relates for the most part to gas works; but, as the large majority of small gas companies on this Coast are also operating electric light plants in conjunction with their gas business, I thought it best to enlarge the scope of this paper so as to cover both. Upon the superintendent of a small company falls the whole management of the company's business, and to him the directors look for the success of the undertaking. With such a responsibility

upon him, let us consider the kind of man the superintendent should be, and what his duties are.

In large and small works alike, whether gas or electric, the superintendent has under his care all the departments of the plant, with the difference that in large works he is relieved of the actual duty of overseeing each particular job, by having under him men competent to carry out his orders, whilst with the manager of a small concern it is not so. He must not only plan the work to be done, but must also carry it out; that is if he expects it to be done in a manner to the best interests of his company. If he does not carry it out himself he will, in the great majority of cases, find to his cost, at some time when he is not prepared for it, that he must do the work over again.

Let me cite you an instance of how my trust in an ordinary gas work's hand resulted; and I wish it to be understood that the man in question was, all things considered, a good hand. I found the man I refer to in the service of the company on my taking charge of the works. One of the first things I found it necessary to do, on taking charge, was to take up a lot of old 3 inch boiler tubes that had been put in as a make-shift for gas mains, and replace them with cast iron pipe. Let me here emphasize that only on extraordinary occasions should the use of make-shifts be allowed, especially in underground or concealed work. I think the axiom that "Anything that is worth doing at all is worth doing well," is a good one for gas men to practice. During the time I was engaged taking up and relaying the line of main I refer to I was called away for a few days. Not wishing to stop the work, on account of the near approach of winter, I concluded to trust to my gas maker to see that the pipe was properly laid. After giving him all necessary instructions, and cautioning him to be sure that all joints were thoroughly tight before refilling the ditch, I left town, thinking the work would go on and be as well done as if I were there myself. On my return, I noticed the output had increased considerably, and at once concluded that the increase was due to a leak somewhere, rather than to an increased demand on the part of our consumers. On going over the half mile of pipe laid during my absence I had no trouble in finding the cause of the increased output. My unaccounted-for gas went up that month to 60,000 instead of 10,000. I was forced to uncover and recaulk nearly every joint in the entire half-mile of pipe. He had totally omitted to cement the joint after caulking, which it is my practice always to do, for I have found that mains laid in that way remain tight for years, needing less care and attention than those laid with a lead joint alone. My man had followed my instruction, as to testing the joints before filling in the ditch; but, as I afterwards found out, he had done so without going through the formality of first taking out the gas bag, hence, as he declared, the pipe was tight when he tested it. Since that time I have not allowed any pipe to be covered until I was satisfied that it was properly laid and perfectly tight. If mains are well laid, and are perfectly tight when first put in, my experience is that they will cause little or no trouble for a long time afterwards; and the manager who gives close attention to the condition of his mains whilst laying will be fully paid for all the care and trouble he takes at that time. The same may be said of services. They should be well laid, thoroughly put together, and painted. I use oil tar, which I find to be the best paint to use around gas works for any kind of ironwork. Nothing less than inch pipe should be used for services. I know that the manager of a small gas works is continually running against the problem of how to get a 1-inch service tapped into a 2-inch main, and he often puts in ¾-inch pipe rather than weaken a 2-inch main, making 1-inch taps, or putting in a saddle. A better plan is to tap a ¾-inch, using a short nipple and reducer at the main as close to it as possible, thence running the 1-inch from the reducer to the meter. If it should afterward become necessary to increase the size of the main all then necessary to do is to tap the larger main for 1-inch instead of ¾ inch.

In looking for the cause of a large amount of unaccounted for gas, the first thing to be done is to examine closely the condition of the old services of all kinds, especially the old street lamp services. All old services not in use should, in my opinion, be cut off at the main and the main plugged. To this source can be traced a large percentage of the unaccounted-for gas, at least I have found it so in my experience.

Another cause of leakage is the use of union couplings with leather gaskets. If unions are used the gaskets should be cut from sheet leads, so as to fit the connection of the union perfectly. In our works if we want to make a union joint we use a running thread and lock nut, and we invariably find a tight joint after years. In a word, this important part of a gas works plant cannot be made too secure. Anything done which tends to keep the mains and services in good condition is time and money well spent. In near importance to these is the meter. Meters should be well looked after: First, by being set in a good dry place, where the temperature will be as nearly as possible the same at all times; second, they should also be easy of access, in order that the readings may be easily taken; third, they should be kept well painted. I find oil tar as good for this purpose as asphaltum varnish—the tar lasting as long as varnish, and looking just as well, at quite a reduction in the cost.

All meters should be tested at intervals. It is not necessary to remove a meter and take it to the shop to test it. The ordinary 5-light portable test meter is the gas man's friend and can be relied on. It will require testing occasionally to make sure of its accuracy. I find it a good plan to use it to satisfy customers, who think their particular meter is too zealous in the company's interest. More than one good customer of mine has been convinced that the trouble with his bill was not the meter, but the way in which the gas had been used, and this conviction has been brought about by the use of the portable test meter. It is an easy matter to watch the test of his meter on his own premises (a test which often results to his own advantage) when it would be impossible to get him to go to the shop for the same purpose. This little instrument, if faithfully used, will often play a conspicuous part in locating the cause of unaccounted-for gas. I speak advisedly, because, as a matter of fact, in my experience, meters are more often found to register slow than register fast, especially after they have been out in use for some time—the customers' opinion to the contrary notwithstanding. One of the most important parts of the plant, and one that needs the manager's constant and close attention, is the retort house; for there, to a great extent, lies his opportunity for profit or loss. The first thing necessary is a well built bench. In works with only two benches, and only one in use at a time, the walls of the bench should be at least 30 inches thick. I prefer 30 inches for the two outside walls, back and top of form proportionately thick. The heat will stay on the inside of such a bench, and the retorts will get the full benefit of all the heat the coke is capable of producing. The setting is also of great moment to a gas man. The style of setting is a matter for his careful consideration. Some prefer the old style of furnace setting, but I do not care to use any other than the half-depth regenerative style of setting. I find that the claim of using less coke in half-depth will not hold good unless the setting is worked up close to its cacacity, making a charge every 4½ hours; but the advantage in this kind of setting, in the works of from 200,000 or 300,000 of output per month, is that one man can make all the gas, charging, from two small charges in summer, to three heavy ones per day in winter. The fires do not need looking after so often. The old open furnace must be fired, at the longest, once in two hours, while the deep furnace can be safely left to care for itself for five hours, thus allowing the man time to take care of the other part of the works. This style of setting also permits of a much steadier and higher heat. The heat is under perfect control, and can be increased or decreased at will, without shortening the life of the retorts. The life of retorts, in this kind of setting, I find to be from three to four years. As a usual thing, we try to make our retorts last too long. It is false economy to run a setting after it has done its duty in long and continued service, and evinces its desire to be placed on the retired list by leaking in some place at every charge. Gas enough can soon be lost to pay for a setting of new retorts. The better plan is to let them down before they become a source of loss. The setting of this type will, if kept in good condition, with the openings of primary and secondary air flues properly adjusted, easily work off in 24 hours five charges of 275 pounds to the retort—the ordinary size 14x24x9 being used—giving a yield of 4½ cubic feet to the pound of coal, and 6,200 cubic feet to the mouthpiece of good gas, of from 16 to 17-candle power. It is claimed by some that they have no trouble in producing 5 feet, and even a little more. It is possible to do so by pulling on the retorts about 2-tenths of an inch, and using very high heats, but it is at the expense of the candle power, or else the coal pile will be correspondingly short at the end of the year; one of these two results is inevitable when the yield is over 4½ to the pound of common Australian coal.

No gas works can afford to be without an exhauster. It increases the yield, relieves the retorts of pressure, and prevents the formation of carbon in the retorts to a large extent, thereby increasing the life of the retort. By its use the seal on the dip pipes in the hydraulic main can be reduced from the ordinary 3-inch to 1 inch or less.

The purification of the gas must be closely looked after. Too much importance cannot be placed on having the gas thoroughly clean. In small works, where one man is doing all the work, this part of gas making is sometimes neglected; the gas is cooled off too quickly, and often deluged with water in the scrubber, not only taking the ammonia out, but the candle power as well. The purifiers are not cleaned as often as

they should be. Nothing is more detrimental to the interests of the gas company than turning out dirty, smoky gas. It is ruinous to meters, stops up the consumers' fixtures, and causes more complaints than all else beside.

To a great extent the financial success of a lighting plant (gas or electric) depends upon the man who is in charge. No company nor its agent can afford, because it has sole possession of the field, to follow a high-handed policy with its customers. If fortunate enough to be in this position of control it should be the constant aim of the manager to shut out all possible opportunity for opposition. I need not remind you that the agents of manufacturers of electrical machinery are always working for an opportunity to organize opposition companies; and this is done for the sole purpose of selling their machinery. This can better be averted while you are in undisputed possession of the field. No small town can support two companies. I give it as my opinion that, in the great majority of cases when new companies have been organized in towns of 10,000 inhabitants and under, that the company in existence is more or less to blame for such opposition and organization. As a usual thing we treat lightly the advent of the fellow who appears on the field and informs our patrons that we have for years been pursuing a course of systematic robbery, and charging exorbitant prices for our services, whilst he at the same time says that, if he is successful in organizing a new company, he will furnish as good, if not better light than we do, at a reduction of 25 per cent. upon our charges. He will state that he does not want or expect to make any large profit, if he is successful in starting a new company in operation. As a matter of fact, such a statement is likely to be true, for his business is to sell machinery at a profit, not light. The result is we find ourselves forced to divide the field with another company, with the inevitable result that a bitter fight ensues, in which both companies lose money, the companies consolidate, or one goes out of business. The manager who is able to successfully stop the organization of a rival company must be ready for action before such a time comes. If he has gained the confidence of his own customers and of the general public by polite, courteous and obliging treatment, by giving a ready ear to complaints, and promptly rectifying the cause of such complaints, and at the same time is supplying light at as low prices as he can, consistently with the cost of producing it, he has already half won every fight.

In the management of small lighting plants too much care cannot be taken in the manner of dealing with our customers. It is from that source our revenue comes. Hence it is absolutely necessary that in dealing with the public we gain their confidence by fair and business-like treatment. The manager who is successful in his management of a lighting company's business must be a live, energetic man, one who gives his personal attention to every detail of the business, from the retort mouthpieces to the collection of bills.

I found it impossible in this paper to give the electric lighting station a due share of attention and not make it unduly long. I will state, however, that the same care and attention given to the gas works must be applied to the electric light station, for the same general principle of success governs both.

Discussion.

The President—Gentlemen, you have listened to a most excellent paper, with many strong points, that will receive your hearty recognition.

Mr. Kinney—As to the use of oil tar; is it boiled or not?

Mr. Petch—I add a little turpentine to it and use it wherever I can; on holders and everything else.

Mr. Wilson—Do you boil it and evaporate it?

Mr. Petch—It is boiled, as I get it from the works in San Francisco.

Mr. Summers—May I ask Mr. Petch what advantage the double joint of both lead and cement has over either the lead joint or the cement joint?

Mr. Petch—It makes it doubly secure. Where I have been in this State in the gas business there has been no great amount of expans'on and contraction. I usually put in about 1¼ inches of lead, leaving from half an inch to three-quarters of an inch space, so I could put cement on the outside, and as it does not cost anything to amount to it simply makes it doubly sure. As a matter of fact we have always had a very small percentage of leakage.

Mr. Clements—I would like to ask Mr. Petch if he really does not depend upon the cement after all?

Mr. Petch—Yes, sir; I do.

Mr. Clements—Then why use lead at all? Why not use cement?

Mr. Petch—I think the cement might crack.

Mr. Clements—Of course in our climate we never have any frost, and, in laying water pipe, we would very frequently make joints of cement entirely in the water pipe. I notice as you use it you seem to leave a space for saving power, and that saving power seems to be, in your opinion, cement.

The President—I can simply add my testimony to that which has already been stated, so far as using one joint or the other is concerned. The history of old joints is so limited in time that I know of no statistics in the matter. Regarding cement joints, in Marysville long strings of pipe were laid 35 years ago. Last year I made enquiry whether they had any trouble with leaks, and the statement was made that the joints were intact as at first. I suppose there is no degree of difference in temperature at the surface or in the ground, and that may account for or be one reason for having intact joints. In some New England towns they prefer cement. Has any one anything further to offer in this matter of the management of small gas works? It interests us all. The American Gas Light Journal once stated there are six small "lighters" to one big one, so we want to hear from those whose experience goes from the retort to the bill.

The Secretary—Mr. Petch has preached us a very nice sermon on the proposition of getting close to the consumers. If I have any hobby at all in the gas business, that is one—to get right close to the consumer. I don't think it is impressed sufficiently upon the minds of gas men, and I believe that at every meeting it should be a topic, so that parties who attend the meeting would go away with a sort of New Year's intention to turn over a new leaf. I think also with Mr. Petch there are two main points in the gas business that want to be looked after more closely than anything else. The points are, the man at the office who meets the consumer and the little gas meter. Those are the two main things. You can afford to lose money in your retort house and have leaky mains, if you will only attend to those two little matters, and I think the one main thing is the man behind the counter. On small gas works especially he makes friends or enemies for the gas company, by his treatment of a man who comes with a well-grounded kick that he has been nourishing in his breast for four or five days, and it gathers force all the time he takes to go to the office. When he gets there, especially if it is a hot day, the vials of his wrath are overflowing, and a man has to be a good bluffer to turn him away thoroughly satisfied. He has to be a Chesterfield in more respects than one. Regarding this thing of looking after gas meters. We frequently use a test meter in our Company. Every one of our meters is gone over once a year. It is examined and tested, and helps to keep down complaints. It lessens your leakage account. It keeps you from making average bills, extending over a long time, and those average bills are a red flag to people all the time. There is where the main kick comes in. Great care and thoughtfulness should be exercised by the superintendent of every gas company. He cannot give too much time to it, because generally you have good men at the retort house and good men on your street mains and good service men, as a rule, who will take good care of your interests; but you must watch your office and watch your meters. (Applause.)

On motion of the Secretary, a vote of thanks was passed to Mr. Petch for his paper.

[To be Continued.]

Machine Mining in Ohio.

R. H. Haseltine, Chief Inspector of Mines, Ohio, in his annual report for the year of 1896, in reviewing the tables which show the number of miners and day hands, and the time that the mines of the State were in operation, etc., says:

By an examination of the summaries of the preceding tables it is found that if from the number of miners employed in the State, the number engaged in operating mining machines be deducted, that there were 17,220 men employed as pick miners, a decrease of 1,425 as compared with the year of 1895. Again, it is found that by deducting from the year's total output of the coal the amount produced by mining machines, that 9,544,259 tons were produced by pick mining, a decrease of 1,019,164 tons as compared with the previous year.

Thus it will be seen that the average yearly production for each miner was 554¼ tons of run of mine coal, an individual loss of 12 tons and 600 pounds, as compared with 1895. In a former table it is seen that the mines throughout the State worked on an average of 151 days from which it will be seen that each miner made an average daily production of $3\frac{1344}{8000}$ tons each day that he worked, as against $3\frac{7440}{2000}$ tons during the preceding year.

The scale rate for pick mining up to the 1st of March for screened coal was 55 cents per ton, when the price was advanced to 61 cents, where it remained until about October 1st, when it was reduced to 45 cents, where it remained until the close of the year. Assuming that

the production was fairly uniform throughout the year, it is found that the average price paid for mining was 56 cents per ton. A rule in general use in the State assumes that ⅔ of the State's production is fine coal. Therefore, at 56 cents per ton (the average price which prevailed during the year) the daily wages of each miner will be found to average $1.47 during the time that the mines were in operation, or a total of $221.55 for the year's work, which would give to each miner an average pay of $18.46 per month, as compared with $18.48 during 1895.

By a table devoted to the exhibition of coal mined by machinery it is found that 3,368,349 tons were produced by this means. By applying the rules and customs in force in the Hocking Valley, where more than 90 per cent. of the machine mined coal originates, it is found that 2,863,097 tons, which equals 85 per cent., came from wide work, as it is commonly known, and that 15 per cent. or 505,252 tons came from narrow work. It has also been found that 579 persons were employed in operating machines, thus making the average yearly production of wide work coal to each machine man 4,944.9 tons, and of narrow work coal 872.6 tons. The average time that the machines worked is given at 132 days, which gives to each miner a daily average production of 37.46 tons from wide work, which at the rate of 7.4 cents per ton, the average price during the year would equal to $2.77. To this must be added the amount produced from narrow work which is found to be 6.06 tons per day. This at 10.4 cents per ton will equal 68 cents. Thus it will be seen that the men who operated mining machines made an average of $3 45 per day during the time that the mines were in actual operation. It will be further seen that the year's earnings amount to $455.40 or $37.78 per month.

As to those who followed the machines and blasted down and loaded out the coal, there were 4,346. Hence, as compensation for loading at 2,863,037 tons removed from wide working at 30 cents per ton, there was paid $858,929.10 and for shooting and loading 505,252 tons from narrow work at 37 cents there was paid $186,943.24, making the total amount paid out for blasting and loading of machine mined coal $1,045,872.34. This was paid to 4,346 miners for 132 days' work.

It will be seen that the average wages while the mines were actually working was $1.80 per day. And for the year's work they received $240.65 or $20.05 per month. It will be observed that the machine miners who were engaged in following the machines worked 19 days less than the pick miners and had but $1.59 per month more on which to support their families. It will also be observed that those who were employed to operate mining machines received more than double the wages paid to the pick miner. It is believed that the difference in the daily earnings between the pick miner and the machine is greater than the returns indicate, as there is no doubt but in many instances the pick miner spent much time in making coal ready when the mines were not in operation. There is no doubt but that the margin per day between the machine runner and the pick miner is less than the returns indicate, as the former under cut a large amount of coal on days when the mines were idle, the relative time of each not being obtainable.

Were it possible to separate the coal mines by the reciprocating machines from that produced by the rotary bar or chain machine, it is thought that the earnings of the machine runners would show a slight increase over the above. The foregoing amounts fairly represent the average earnings in the several subdivisions of mine labor as shown by the returns for the year that has just closed.

Simple Tests of Impurities in Gas.

Mr. Henry O'Connor is contributing a very interesting series of articles on "Gas Manufacture and Appliances," to *The Gas World*. In the last chapters of the series that have come to hand the author describes as follows some simple tests for impurities:

At this stage we may profitably examine into the various methods of testing the gas for impurities. It will be best to notice the simplest ones first; and perhaps the simplest of all is the test for H_2S, which is done by means of acetate of lead, which has the property of turning brown when exposed to any gas containing H_2S. The old-fashioned way, which was suitable enough when every part of the works was within a very short distance of the office, and the tests were not required to be so accurate as at present, was to take a bottle of sugar of lead solution to the spot where the test was to be made and there soak a piece of paper with the solution; on being exposed to the gas, the paper turned brown if any H_2S was present. The trouble, however, of having to carry about a bottle induced an alteration which has been almost universally adopted. This consists of taking bibulous or blotting paper and moistening it with a solution of sugar of lead 1 part, and water 8 or 9 parts, each sheet being held over a strong solution of ammonia for a few moments while still damp. These papers are sensitive to so small a quantity of H_2S as 0 001 per cent. by volume if subjected to a stream of gas for 24 hours; but the light must be excluded the while. The papers should be dried and cut up in strips, which can be then carried about in the pocket, preferably in a small tin box with a cap, or, if made round, with a cork, to exclude any sulphureted hydrogen which might otherwise get to the papers and turn them brown. For the same reason precautions should also be taken to prevent any H_2S from coming into contact with the papers while drying.

The next simple test is that for ammonia, for which papers soaked in turmeric are used. These change from a full yellow color to a brownish tint if ammonia be present. To make the turmeric papers, take one part of turmeric powder and place in six parts, by weight, of methylated spirit; shake often for three days; decant the clear liquid and soak sheets of filtering or botanical paper in it; dry and exclude from light. The paper thus prepared should be of a full yellow color, and should become of a brownish tint if the stream of gas to which it is submitted contain 1 grain or more of ammonia per 100 cubic feet. Another, and perhaps a more simple test, is to use red litmus papers for ammonia. These are made by dissolving one ounce of powdered blue litmus in six ounces of cold distilled water. The mixture should be shaken and then allowed to dissolve; filter, and add just sufficient sulphuric acid (diluted) to change the color to a red tint. Use glazed paper to soak in it, and dry. These papers will turn blue when exposed to gas containing ammonia. In most works slips of paper coated with acetate of lead are subjected to a stream of gas during the whole 24 hours. Two strips are hung on each side of an upright tube with outlets on each side facing the papers. The gas passes up the tube against the papers and then out to a burner, which is kept constantly lighted, the tube and papers being covered with a glass case. Suitable provision is made for the removal of the papers and substitution of new ones. In some cases the glass cover is sealed in mercury, while in others the glass is a short cylinder with metal top and bottom portions, having rubber washers and means for drawing the two ends together and preventing the escape of the gas. In almost all, however, the papers are attached to ground plugs which fit into holes in the top of the case, so that they can be easily removed and a tight joint quickly secured. In all, arrangements must be provided for keeping the papers wet; and this is usually done by having small cups fitted in such a position that the papers, when in place, will dip just into the water, the hygroscopic nature of the bibulous paper ensuring that the papers are kept moist.

While upon the subject of simple tests a description of the lime water test for CO_2 will not be out of place. Take four ounces of caustic lime and dissolve in one quart of water; decant, and keep from any contact with CO_2. If after gas has been bubbled through for three minutes the liquid is quite clear, then no CO_2 is present. If, on the other hand, the liquid becomes thick and turbid, the fact that there has been a change from calcinm oxide (CaO) to calcium carbonate ($CaCO_3$) is evident, thereby proving the presence of CO_2. Any H_2S should be removed from the gas before making this test, which can be done with a small oxide of iron purifier through which the gas can be first passed.

Quantitative Tests.—All the tests already treated of are merely qualitative ones, or, in other words, only indicate that the different impurities are present in the gas. Sometimes, however, it is required to know the quantity of each impurity. Then more elaborate tests are necessary. As regards H_2S the tests are made with either cupric phosphate or cadmium chloride and are somewhat too elaborate to be described in the limit of these articles. Further, as the whole of the H_2S should be removed from the gas, until there is no trace perceptible, the test is seldom wanted, the acetate of lead papers serving to prove if all has been removed or not. As regards the other impurities, however, the tests are more simple, and are more often required. One of the most simple and effective testing apparatus is that known as Harcourt's color test, after its inventor, Mr. Vernon Harcourt, F.R.S. The speed with which a test can be made by it is a further recommendation. It serves for testing for H_2S, CO, and more particularly CS_2. The apparatus for testing for the first named impurity consists of an aspirator for drawing the gas through, and a tube, with the bottom end closed, filled to about three parts its height with a dilute solution of lead syrup. The gas is led to nearly the bottom of the tube through a very fine glass tube passing through a rubber cork. A second pipe connected to the aspirator draws the gas away after it has bubbled through the liquid. Another tube of the same dimensions as the first is filled to the same height with a liquid of a fixed color. The gas is then passed through the lead solution until the color becomes the same as in the second tube, when the quantity of water run off from the aspirator, which is equal to the amount of gas passed through the lead syrup, is

noted. As the quantity of sulphur necessary to turn the syrup to the required color is known, it can be easily understood how the quantity per 100 cubic feet of gas can be calculated from the data thus obtained. By substituting a lime solution for the lead and passing the gas through as before until the same amount of turbidity is obtained as in another comparison tube, the quantity of CO_2 can be ascertained; but the H_2S must be first removed.

The principal use of the Harcourt color test is, however, for the determination of the quantity of CS_2 in any gas. For this purpose an additional piece of apparatus is required—namely, a bulb filled with platinized pumice. This is heated by a gas burner, and the gas is made to pass through it on its way to the tube, which is again filled with lead syrup solution. The same color tube is used as in the test for H_2S, and the test is carried through in the same manner. The effect of passing the gas through the platinized pumice is to decompose the CS_2 into sulphureted hydrogen and other gases. The H_2S then bubbles through the lead syrup and turns it brown like the standard color tube. By a calculation from the quantity of gas passed the amount of CS_2 can be obtained. To change the color of the solution 0.0187 grain of lead sulphide is required, which will equal 0.0025 grain of sulphur. Thus it is easy to get at the quantity of sulphur present in the gas.

The measuring cylinder used with the aspirator is divided into two-thousandths parts of a cubic foot. It should also be mentioned that all H_2S should be removed from the gas, before the test is made, by means of a miniature oxide purifier, or this will also be included in the amount of sulphur found. A table, which is worked out from the formula $S = \frac{500}{V}$, V equaling the number of divisions of the measuring cylinder noted, is provided, by which the amount of sulphur is immediately obtainable. It may be mentioned that the lead solution may be used several times over, as it loses its color after exposure to light for a few hours.

When it is desired to know the amount of sulphur other than H_2S, it must be borne in mind that there are other sulphur compounds besides bisulphide of carbon (CS_2) which are not converted into H_2S when passed over the heated platinized pumice, and as these amount to about 8 grains per 100 cubic feet of gas, that should be added to the quantity of grains obtained in the above experiment.

The Metropolitan Gas Referees recommend certain other tests for some of the impurities mentioned, but as these are generally only used for testing the gas as it leaves the works, they will be dealt with at a later stage.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE increased and increasing use of gas in Kansas City, Mo., is shown by the simple statement that, on August 1st, 1896, the number of meters set was, roundly, 17,000; whereas, on August 1st, 1897, the meters placed numbered about 22,000.

MESSRS. WM. M. CRANE & Co., 838 Broadway, New York, inform us that they have been appointed sole agents in America for the world-known burners manufactured by Messrs. Geo. Bray & Co., of Leeds, England. The Messrs. Crane will keep in stock a full, complete line of the goods named.

SUPERINTENDENT JOHN DUDLEY, of the Portland (Ore.) works, is engaged in making a complete and systematic overhauling of the street main system. Quite some leakage was discovered in the lower portion of the district north of Burnside street; but, on the whole, so far as the investigation has progressed, the mains have been found in very fair condition.

THE proprietors of the Vancouver (British Columbia) Gas Company, Limited, have renewed their offer to sell the plant to the authorities for the sum of $250,000.

MR. S. M. HIGHLANDS, the clever managing man of the Clinton (Iowa) Gas Light and Coke Company, is engaged in drawing fish from the waters that wander over and about the coast of Maine. We hope that he will find time to hunt up T. G. Lansden, who is also doing the fishing and other acts at South Harpswell, Maine. In that event we might next fall have authentic accounts of the numerous and weighty catches made by these reliable gas men. We are glad to say that Mr. Highlands is very much improved in health, and that Lansden is as rugged as of yore.

THE last report of Mr. A. D. Meeds, official gas inspector for Minneapolis, Minn., shows that the gas supplied by the Minneapolis Gas Light Company during July averaged 24.87 candles in illuminating value. The average consumption of gas in the street lamp burners was 5.90 cubic feet per hour.

JUDGE SHAW has refused to make permanent an injunction, asked for by Messrs. T. S. C. Lowe, L. P. Lowe, L. A. Lowe and others, against the proprietors of the Pasadena (Cal.) Consolidated Gas Company, to restrain the sale at auction by the latter of certain shares of stock upon which an assessment that had been levied was returned unsatisfied, or delinquent. The sale of the delinquent stock was subsequently carried out in the regular way.

DURING the first week of this month the Cleveland Gas Light and Coke Company paid into the city treasury of Cleveland the sum of $24,508.96 on account of the ordinance requiring the Company to pay to the city each half-year the sum of 6½ per cent. of its gross receipts for gas sold. The Peoples' Gas Light Company's payment on similar account amounted to $5,274.10. The total sum so far received by the city under the agreement (the fund is to be eventually used in the construction of a new city hall building for Cleveland) amounts to something like $260,000.

MR. W. H. FRITCHMAN, of New York, has been engaged to make an expert examination of the physical condition of the gas and electric light plants, operated for public account by the authorities of Alexandria, Va.

THE Albany (N. Y.) *Journal* says that the Ballston Spa. (N. Y.) Light and Power Company, which sometime ago purchased the property and rights of the Ballston Gas Company is about to begin the construction of an entirely new gas plant.

The Cincinnati Gas Light and Coke Company may extend its mains to the adjoining suburb of Hartwell.

PRESS despatches from Port Huron, Mich., are to the effect that the Port Huron Gas Light and Fuel Company has applied to the Common Council for an amended franchise, permitting it to charge $1.25 per 1,000 cubic feet for gas sold on illuminating account, and 75 cents per 1,000 for fuel account. Under its present charter the Company cannot charge in excess of $1 for an illuminating use and 50 cents on fuel account. In the petition to the Council for relief the Company boldly states that it cannot manufacture and distribute at a profit fuel gas for 50 cents per 1,000.

THE Worcester (Mass.) *Spy* recently said that the contract between the city of Worcester and the Welsbach Street Lighting Company for 200 Welsbach street lamps, as recently ordered by the City Council, has been drawn by Superintendent Knight, of the street lighting department, and awaits the examination and approval of City Solicitor Rugg. The city is to erect the necessary poles and make the connections with the gas mains in order that the Company shall have no locations in the city streets. About all the rest of the work will be done by the Company. The lamps will be lighted and cleaned and generally maintained by the Company, but the contract stipulates that the lighters and cleaners shall be citizens of Worcester. The city is further protected from any patent right suits that may be brought on account of the use of the lights, and it is also agreed that the city is entitled to the benefit of any improvements in the lighting system that may be made by the Company while the contract lasts. The contract price for the lights is $30 each per year. The new lamps will be located where the present gas lamps of the city are. It is calculated, however, that 200 Welsbachs will replace to much better advantage the 250 ordinary lamps maintained. Superintendent Knight expects to have the lamps lighted by September 1st.

THE following is from the St. Paul (Minn.) *Pioneer Press* of the 4th inst.: The Board of Directors of the St. Paul Gas Light Company decided not to pay the usual quarterly dividend, and authorized the officers to increase the selling rate to at least $1.45 per 1,000 cubic feet—the price at present is $1.30. The reason given for the rise is the action of the Board of Equalization in raising the Company's assessment. F. W. M. Cutcheon, Vice-President of the Company, said last night: "The explanation of the action taken by our Board is simply this: It has been the policy of the Gas Company practically ever since it began business to reduce the price at which gas is sold as rapidly as the conditions of its business would warrant. Within the last few years the Company has gradually but voluntarily reduced the price of gas from something over $3 per 1,000 feet to $1.30 per 1,000 feet. This policy has been pursued from a threefold motive—in order to in-

crease the Company's business, in order to minimize the friction that is always developed in dealings between a municipality and a company that controls a business in which large numbers of the citizens of the municipality are concerned, and in order to satisfy the public so far as possible. To make the reductions mentioned it has been necessary of late years to enforce the most rigid economy in the Company's business and to be satisfied with very small returns upon the Company's investment. By reason of the reduction in the price of gas, from $1.50 net to $1.30 net, made June 1, 1896, and of the larger reduction in the prices at which the city streets and municipal buildings are lighted, which was made at the same time, the earnings of the Company were so far diminished that it became necessary to reduce the dividends paid upon the Company's stock and then to cease paying dividends altogether. During the past year we have earned little more than enough, in addition to operating expenses and fixed charges, to make the extensions and replacements which are requisite to enable the business to go on. Then, too, for nearly two years the Company has consistently pursued an even more liberal policy than heretofore. Every reasonable and many extraordinary efforts have been made to satisfy all demands of every customer, as well as the city and public generally. This policy has cost money, and has diminished profits already reduced. While the Company has not in any sense been embarrassed, its stock has suffered very seriously in consequence of the failure to pay dividends, a result entailed by the course of action referred to. This result, however, has been cheerfully borne by the shareholders in the hope and belief that with a return of better times and a realization upon the part of the public of the effort the Company has been making, not only to satisfy every reasonable demand, but to pursue a liberal and even generous policy, the Company's business would be so largely improved that dividends could again be paid, and that such increase of business, when it should come, would be permanent. It was our hope also that in consequence of this course the bickerings that have sometimes marked the dealings between the city and the Company would cease. In this hope we seem to have been completely disappointed. Each concession, each manifestation of willingness to oblige the municipal authorities, has proved but an invitation to some new attack upon the Company's prosperity.

"Last Saturday the Board of Equalization saw fit to assess the personal property and franchises of the Company at the sum of $1,500,000. The action of the Board of Equalization, if insisted upon and successfully maintained, will increase our taxes to about $37,500 per year, a net increase of nearly $25,000. Even if our franchises be legally taxable (and we have always contended that they are not), this assessment is many times the value of both our personal property and franchises. The Company has little personal property aside from its mains, meters and repair stock, and its franchises, by reason of the development of the electric lighting business, have ceased to be exclusive, and have but nine years to run. If the Company should be compelled to pay a tax on the basis of this new assessment, it would be unable, unless the price of gas were increased, to pay its fixed charges after paying its operating expenses and the cost of making the absolutely necessary replacements, for, owing to the present condition of business it is impossible for it to sell bonds.

"This situation leaves the Board of Directors but one resource—to raise the price of gas. After the explanation I have given of the purposes that the managers of the Company have entertained, every one must understand with how much reluctance we shall take this course, if driven to it. It will mean practically a complete reversal of the policy pursued during the last two years. In any event, we shall increase our price only enough to reimburse us for the amount we are obliged to pay in taxes over and above the amount we paid last year, that is to say, enough to yield an additional income of substantially $25,000. This will necessitate raising our price to at least $1.45 per 1,000 feet net, if not more, and this, in case the action of the Board of Equalization is insisted upon successfully, we must and surely will do. This statement is neither a threat nor a bluff. If driven to this action we shall take it with great regret, and we shall take it only if driven to it, but in that case we certainly will do what I have said, and I am sure no one can justly criticise us for doing so. The result will be that the people of this city will have taxed themselves $25,000 a year more than they are now taxed, and not for their own exclusive benefit, but for the benefit of the State as a whole. They will have seriously embarrassed a great and fairly prosperous business, upon which some 1,250 people of the people of the city are absolutely dependent, and which indirectly contributes very powerfully to the prosperity of the whole city. They will have antagonized a body of men whose whole endeavor since they took control of this property has been to earn success for the Company by satisfying the public. The injurious consequences to the city as well as to the Company must be considerable. They will have done all this with no advantage to the city, to the taxpayers or to the public generally. It will be but another instance of the short-sighted policy pursued by our people, who seem to have learned little by observation of the superior success of a different policy which has been applied successfully in neighboring cities. Our people seem resolved to take a leaf from the book of Duluth. They would better turn their attention to their more successful rival up the river.

"Just one suggestion more: The whole theory of the present method of taxing the property of companies of this sort seems to me to be erroneous. In the nature of things its property has only a varying value, which must be computed upon the basis of its earnings. Its tangible property, if no longer used, has practically no value. In other words, its property has no salable value. It is always unfair, sometimes to the Company and sometimes to the State, to attempt to assess this property as ordinary property is assessed. A fair system of taxation would impose a reasonable tax upon the gross earnings of the Company—such a tax as is imposed upon the railway companies in this State. Under such a system the tax which our Company paid last year would be approximately correct."

THE United Gas Improvement Company is rebuilding the plant of the College Point (N.Y.) Gas Light Company. Amongst other things the contract authorizes and directs the contractors to install a set of its standard, junior Lowe water gas apparatus, of the type advised for small works.

THE main system, at Paterson, N. J., is being extended. The scale of the addition is by no means on the small side.

A CORRESPONDENT at Omaha, Neb., writes that the business relations existing between Mr. D. Cameron, President of the Company (the South Omaha Gas Light Company) recently chartered to distribute gas in South Omaha, and Mr. Frank Murphy, President of the Omaha Gas Company, are sufficiently intimate to warrant the prediction that the latter Company will manufactu.e all the gas that will be distributed in South Omaha for years to come.

THE executive management of the reorganized St. Joseph (Mo.) Gas Company can be written down as follows: President, Emerson McMillin; Vice-President, W. A. P. McDonald; Secretary and Treasurer, W. F. Douthirt; Manager, K. M. Mitchell.

MR. MAX A. BAUM has resigned the position of Superintendent of the Florence (Ala.) Gas Light and Fuel Company. His successor is Mr. George E. Harper, son of Mr. G. H. Harper, of the Altoona (Pa.) Company.

THE Common Council of McKeesport, Pa., has assented to the ordinance under which the Union Gas Company of that city is to conduct its business. The maximum rate that the Company may charge is $1 per 1,000 cubic feet. The Company also agrees to supply gas to the public buildings free of charge.

THE second syndicate in the field, for the purpose or with the object of securing control in the Louisville (Ky.) Gas Company, is said to be offering $110 per share, which is an advance of $2 per share over the bid made by Mr. J. T. Gathright and his party.

THE surmise now is that the parties who endeavored to secure the purchase of the New Haven Company's stock at $69 per share have been unable to accomplish their purpose.

THE proprietors of the Peoples Gas Light Company, of Manchester, N. H., have completed a very successful series of demonstration lectures on cooking by gas. Miss Lucy C. Andrews, of New York, was the demonstrator.

A LINE from Indianapolis, Ind., is to the effect that the Council has passed an ordinance directing the Indianapolis Gas Company to reduce its selling rate to 75 cents per 1,000 cubic feet—a cut of 50 cents per 1,000.

MR. GEORGE KILGORE has leased the plant of the Dual City Gas Company, of Grand Forks, N. D., for a term of two years. The lease took effect the 1st inst.

THE consolidation of the Companies heretofore comprising the corporation known as the Chicago Gas Trust was made early this month. The following is a copy of the formal certificate of amalgamation, as filed with the Secretary of State—each Company, through its President, forwarding a signed copy thereof: "Know all men by these presents that I, C. K. G. Billings, President of the Peoples Gas Light and Coke Company, do hereby certify that the Peoples Gas Light and Coke Company, together with the Chicago Gas Light and Coke Company, the Economic Fuel Gas Company, the Consumers Gas Company, the Equitable Gas Light and Fuel Company, the Suburban Gas Company, the Lake Gas Company, and the Illinois Light, Heat and Power Company, have been merged and consolidated into the Peoples Gas Light and Coke Company, under and in pursuance to an Act of the General Assembly of the State of Illinois, entitled, 'An Act in relation to gas companies,' approved June 5, 1897, and in force July 1, 1897." The officers named to direct the affairs of the consolidated corporation are: Directors, Anthony N. Brady, Walton Ferguson, Roswell P. Flower, C. K. G. Billings and Frederick S. Winston; President, C. K. G. Billings; First Vice-President, Anthony N. Brady; Second Vice-President, Walton Ferguson; Third Vice-President, Clarence K. Wooster; Secretary and Treasurer, L. A. Wiley; Assistant Treasurer, John S. Zimmerman; Second Assistant Secretary and Treasurer, F. A. Crane.

THE dividends returned on shares of gas companies largely held in San Francisco, during July, 1897, amounted to $98,275, as against $84,833 returned for the corresponding month of 1896.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

MONDAY, AUGUST 16, 1897.

The Market for Gas Securities.

The market for city gas shares was somewhat easier during the week just closed. Consolidated having sold down to 182, subsequently recovering to 190, and then sagging off again. To-day (Friday) the opening was made at 188. Standard common is in considerable demand at 124 bid, and the preferred is 130 bid. East River issues are dull and neglected, but the truth is that they have a greater intrinsic value now than ever before. The agreement between those in interest in the gas supply of New York is virtually complete. We advise the purchase of all city gas shares, preferably Consolidated. Equitable is 260 bid, and Mutual is said to be offered at 255.

In out of town gas shares the feeling is that, although marked gains in values have already been made, top prices have not been reached. Lacledes, common and preferred, are strong, and a persistent effort is being made to mark up Detroit gas.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

AUGUST 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	186	189
Central	500,000	50	195	..
" Scrip	230,000	..	100	.
Equitable	4,000,000	100	260	262
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	253	255
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	.
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	87	89
Preferred	2,000,000	100	116	118
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	105	106½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	124	126
Preferred	5,000,000	100	130	131
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	119	120
" " Bonds (5's)	15 000,000	1,000	115	..
Bay State	15,000,000	50	13¼	14¼
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	90	92
2d " " "	3,000,000	1,000	74	75
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co.	25,000,000	100	103	103½
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds.	7,650,000	1,000	104	104¼
Columbus	1,069,000	..	78	80x
1st Mortgage	1,085,000	..	..	96
Consumers. Jersey City	2,000,000	100	73	77
" Bonds	600,000	1,000	101½	103
Cincinnati G. & C. Co.	8,500,000	100	203	203½
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	.
Consolidated, Baltimore	1,000,000	100	60	60¼
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	.	32	33
" Con. Bonds	4,312,000	..	85	88½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	83	84
" Bonds	2,000,000	..	93	95
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	152	155
" Bonds, 6's	2,650,000	..	107	109
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	88	89
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	38½	39¼
Preferred	2,500,000	100	93	93½
Bonds	9,034,400	1,000	102	102½
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	142	..
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	83	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10,000,000	100	94	94½
St. Paul Gas Light Co.	1,500,000	100	79	81
1st Mortgage, 6's.	650,000	..	84	87
Extension, 6's.	600,000	..	..	..
General Mortgage, 5's.	2,400,000	.	88	90
Syracuse, N. Y.	500,000	25	..	..
Washington, D. C.	2,000,000	20	250	.
Western, Milwaukee	4,000,000	100	84	8
Bonds, 5's	3,556,000	.	98	100
Wilmington, Del.	550,000	50	200	202

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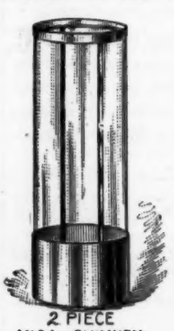

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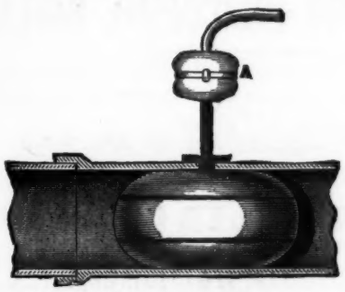

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4 "	"	"	.80	16 "	"	"	8.25
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6 "	"	"	1.75	24 "	"	"	17.00
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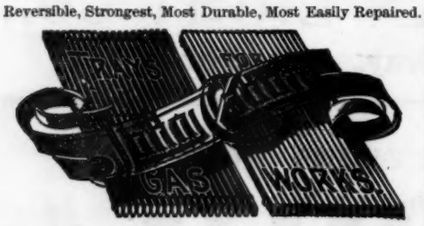

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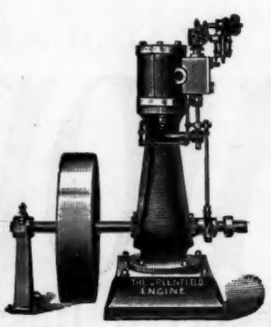

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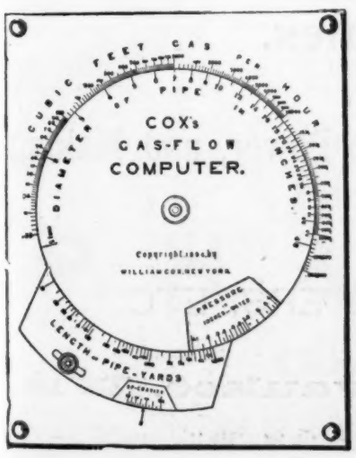

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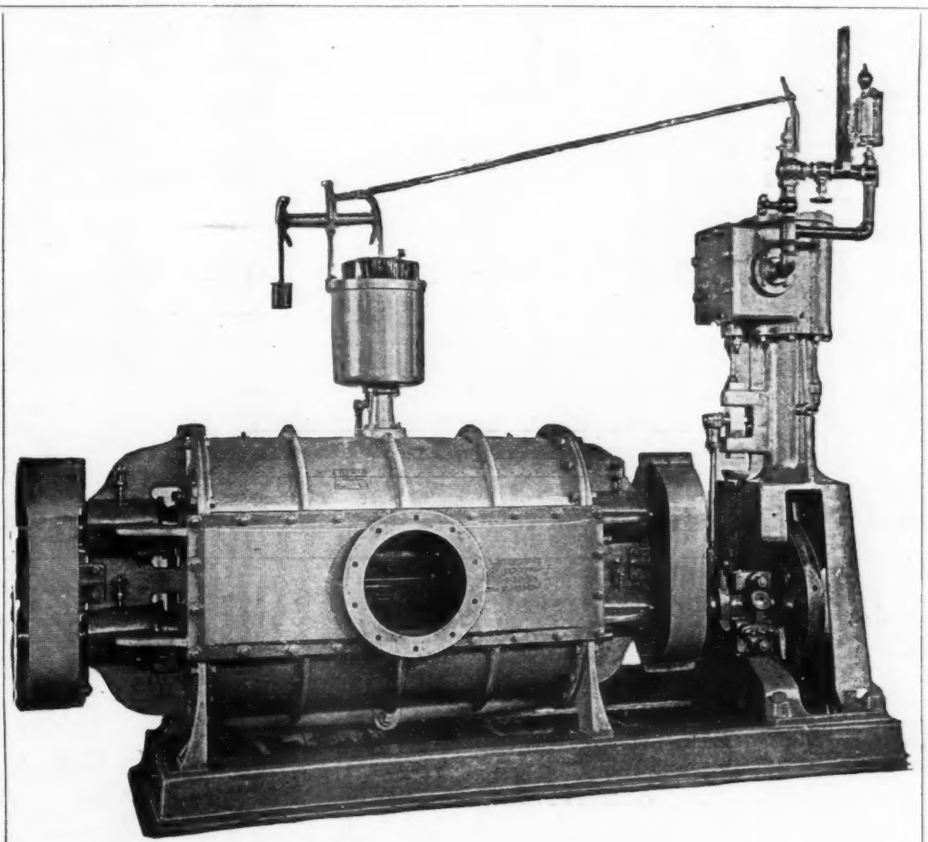

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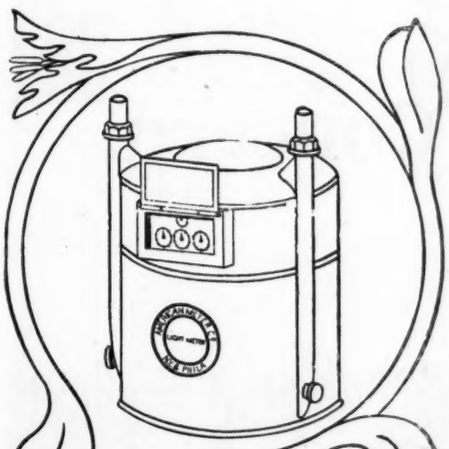

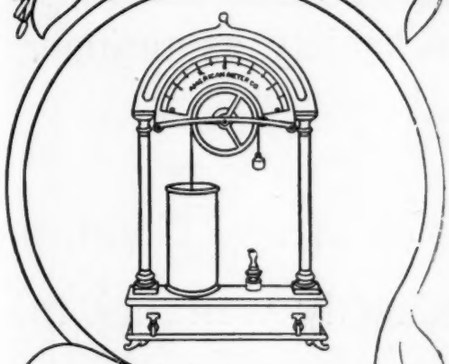

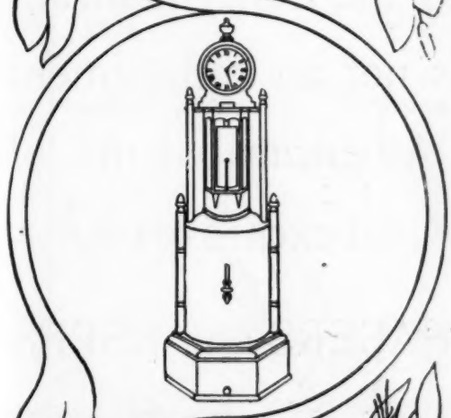

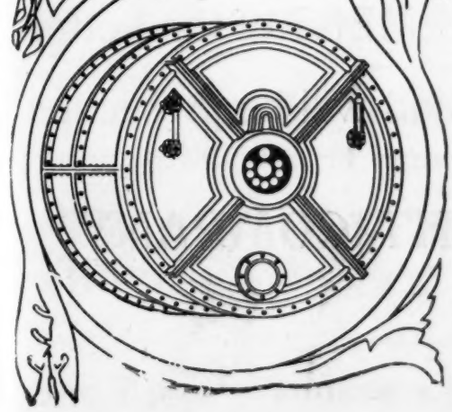

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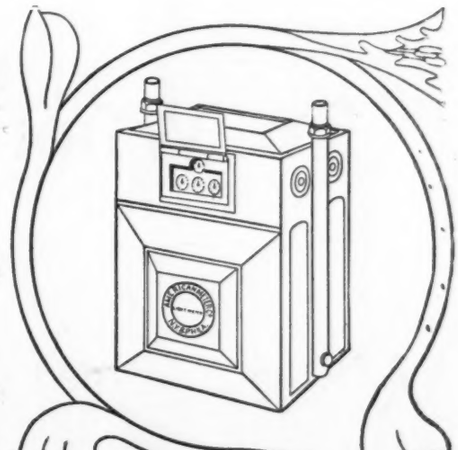
PUBLIC LIGHTING TABLE.

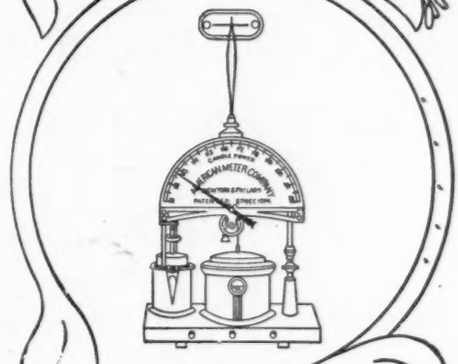
SEPTEMBER, 1897.

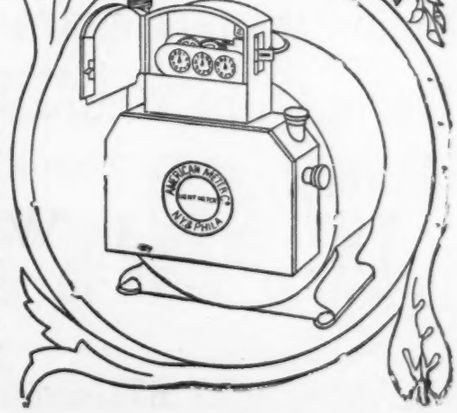
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Wed.	1	7.40 PM	4.30 AM	6.30	4.20
Thu.	2	8.20	4.30	6.30	4.20
Fri.	3	9 10 FQ	4.30	6.15	4.30
Sat.	4	10.20	4.30	6.15	4.30
Sun.	5	11.20	4.30	6.15	4.30
Mon.	6	12.40 AM	4.30	6.15	4.30
Tue.	7	1.50	4.30	6.15	4.30
Wed.	8	3.00	4.30	6.15	4.30
Thu.	9	No L.	No L.	6.15	4.30
Fri.	10	No L.FM	No L.	6.05	4.40
Sat.	11	No L.	No L.	6.05	4.40
Sun.	12	6.40 PM	7.40 PM	6.05	4.40
Mon.	13	6.40	8.00	6.05	4.40
Tue.	14	6.40	8.30	6.05	4.40
Wed.	15	6.40	9.00	6.05	4.40
Thu.	16	6.40	9.40	6.05	4.40
Fri.	17	6.40	10.20	5.55	4.50
Sat.	18	6.40 LQ	11.10	5.55	4.50
Sun.	19	6.30	12.10 AM	5.55	4.50
Mon.	20	6.30	1.10	5.55	4.50
Tue.	21	6.30	2.20	5.55	4.50
Wed.	22	6.30	3.20	5.55	4.50
Thu.	23	6.30	4.50	5.55	4.50
Fri.	24	6.30	4.50	5.40	5.00
Sat.	25	6.30	4.50	5.40	5.00
Sun.	26	6.20 NM	5.00	5.40	5.00
Mon.	27	6.20	5.00	5.40	5.00
Tue.	28	6.20	5.00	5.40	5.00
Wed.	29	6.20	5.00	5.40	5.00
Thu.	30	6.20	5.00	5.40	5.00

TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45







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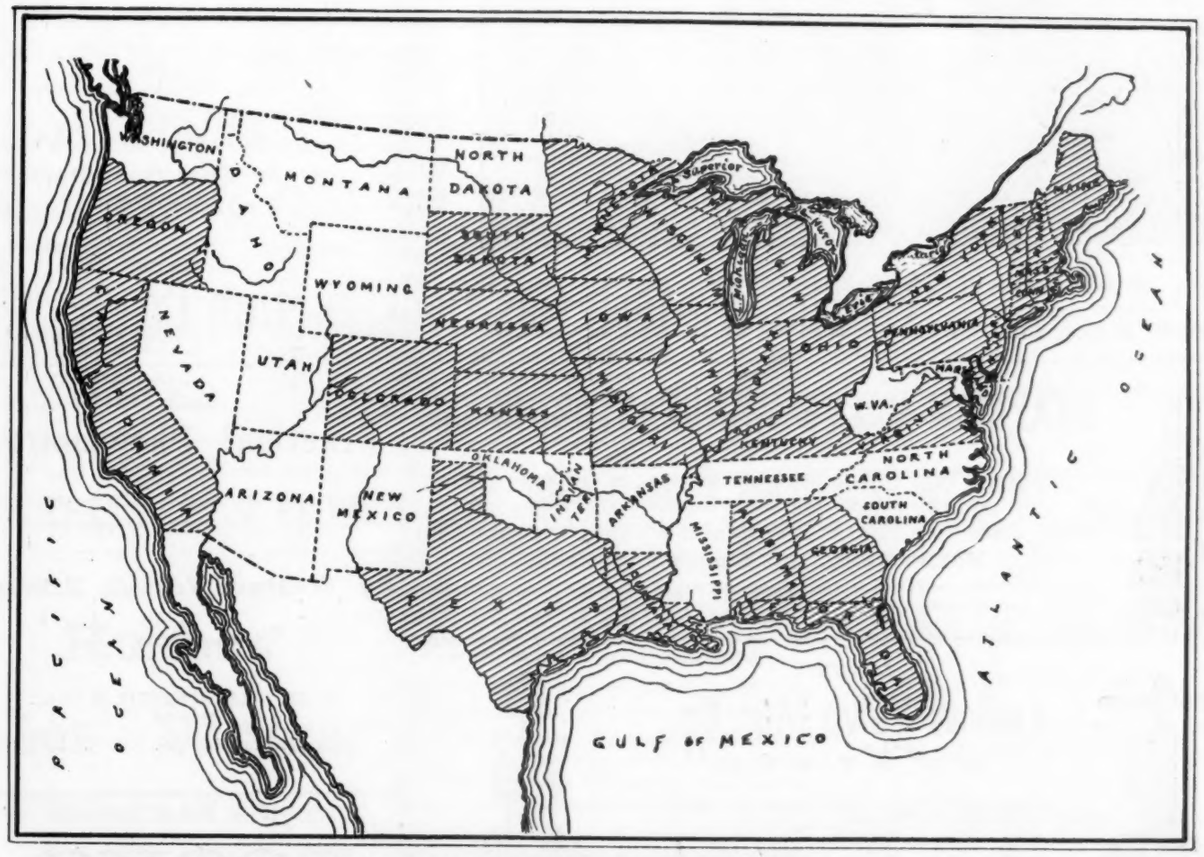

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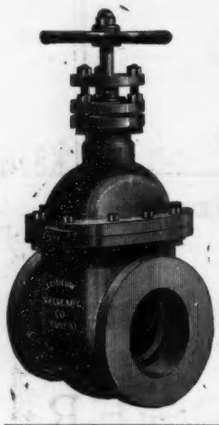

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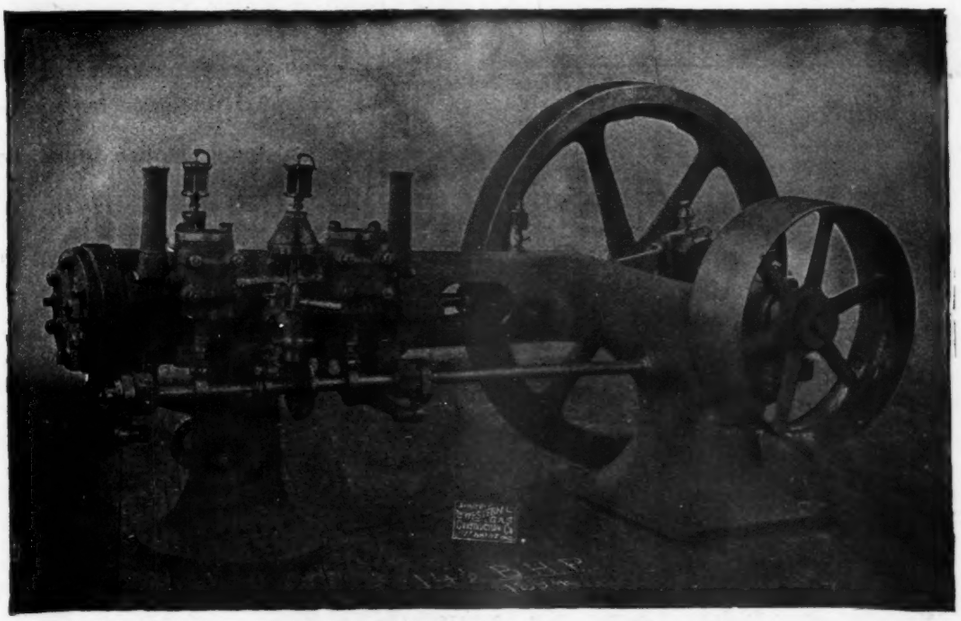

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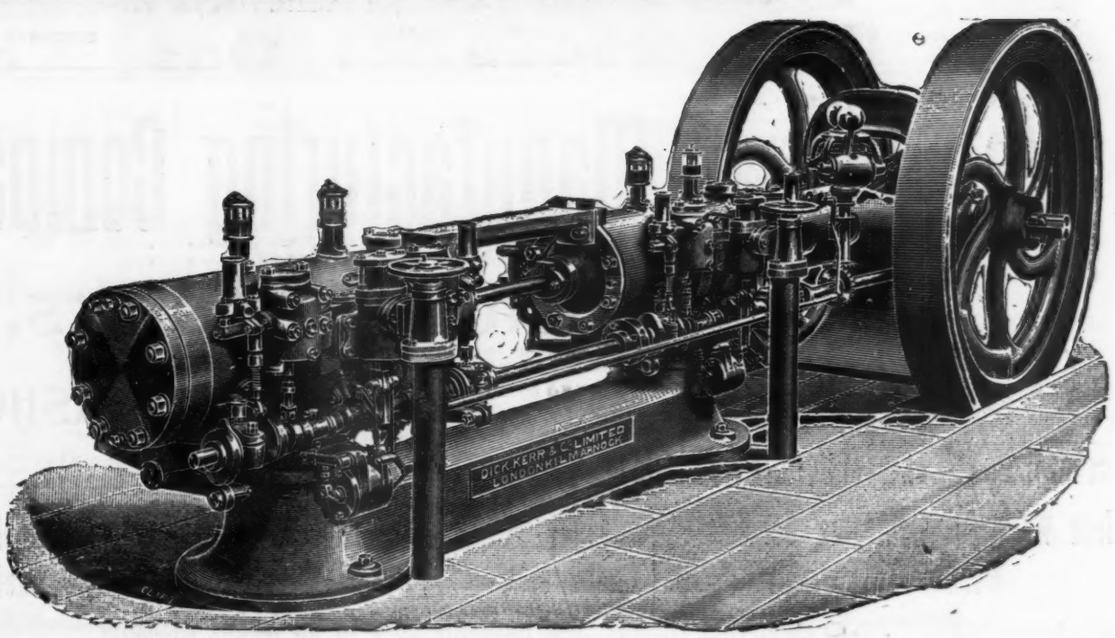

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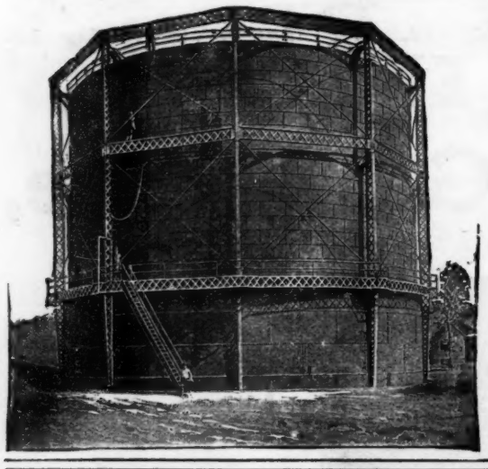

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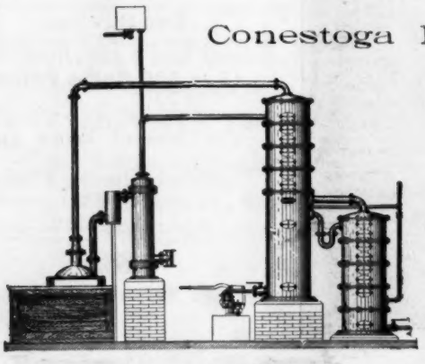

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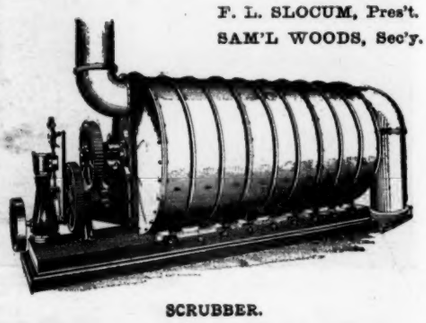

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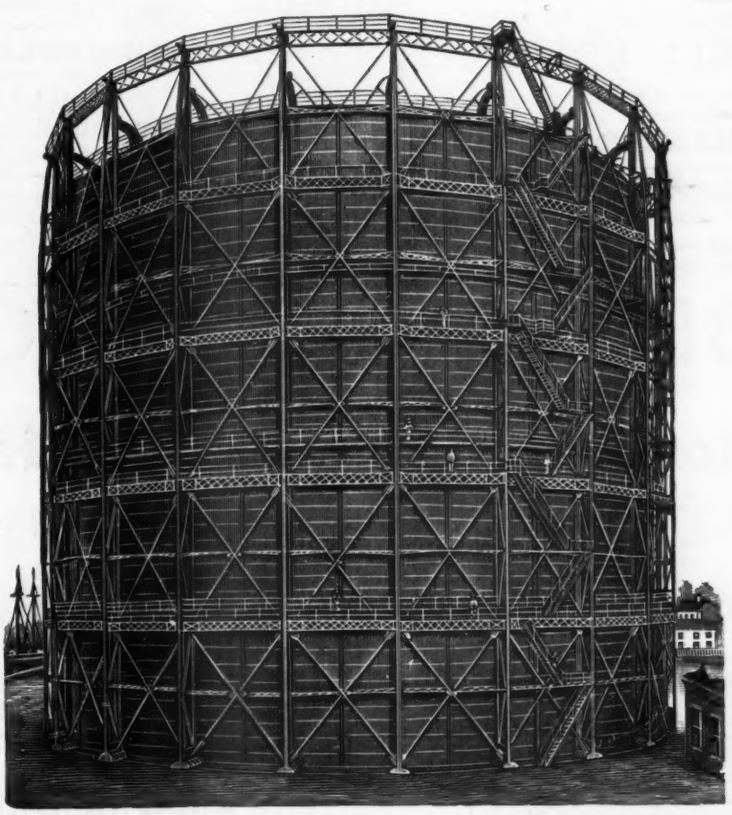

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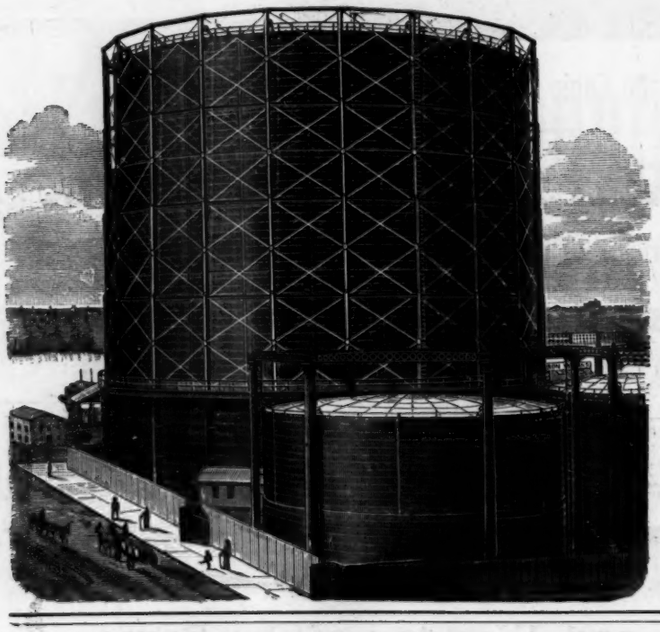

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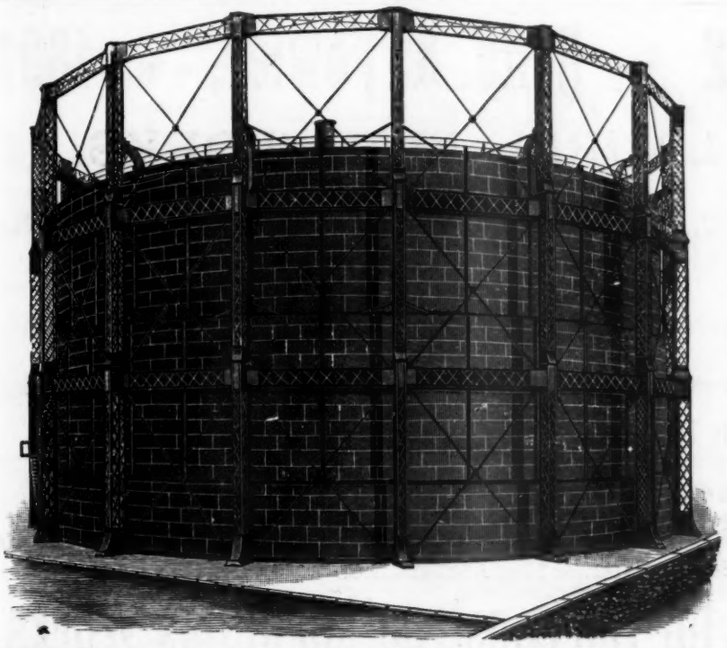

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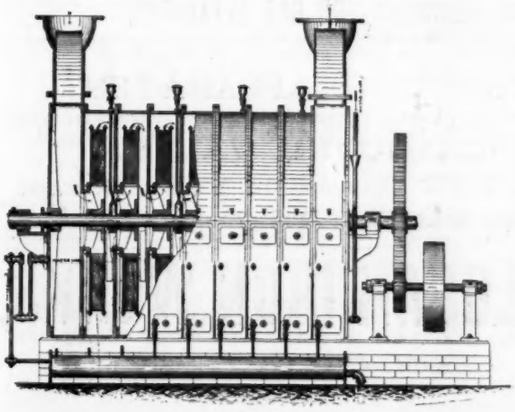

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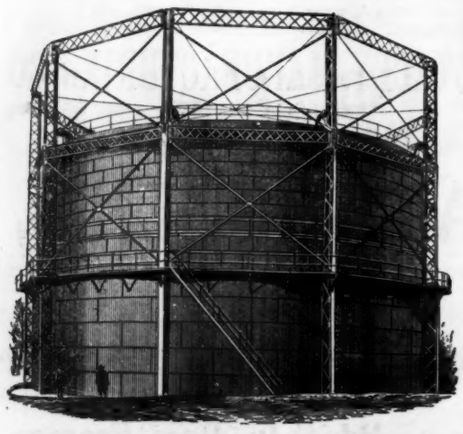

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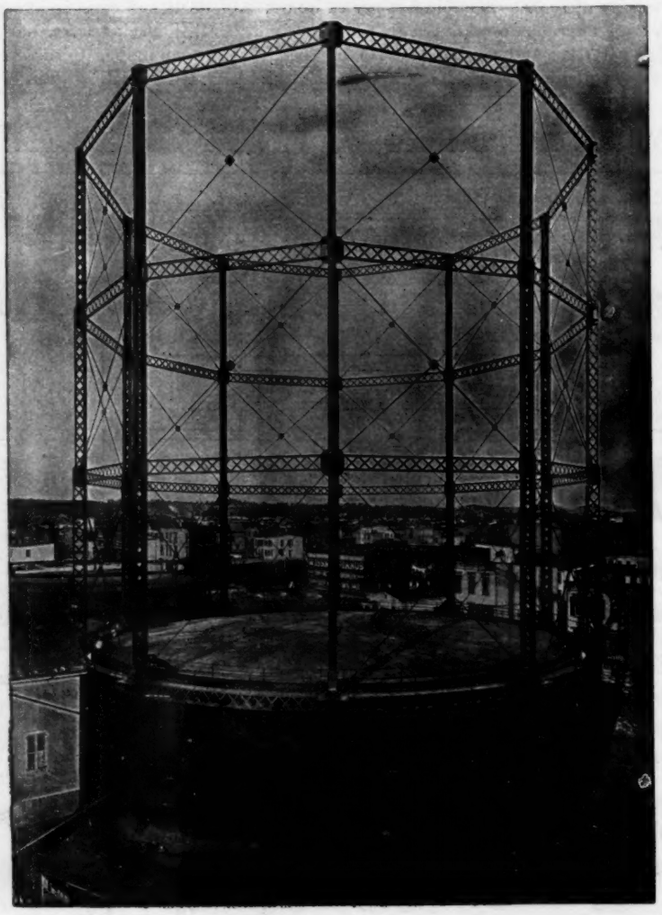

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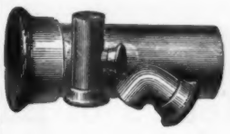

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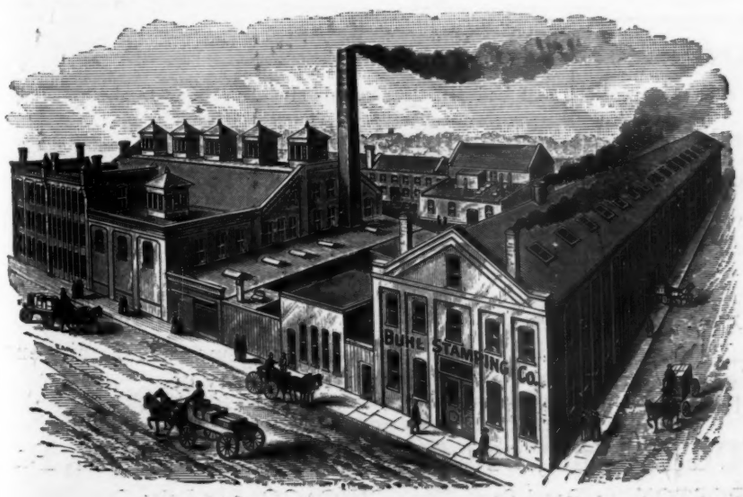

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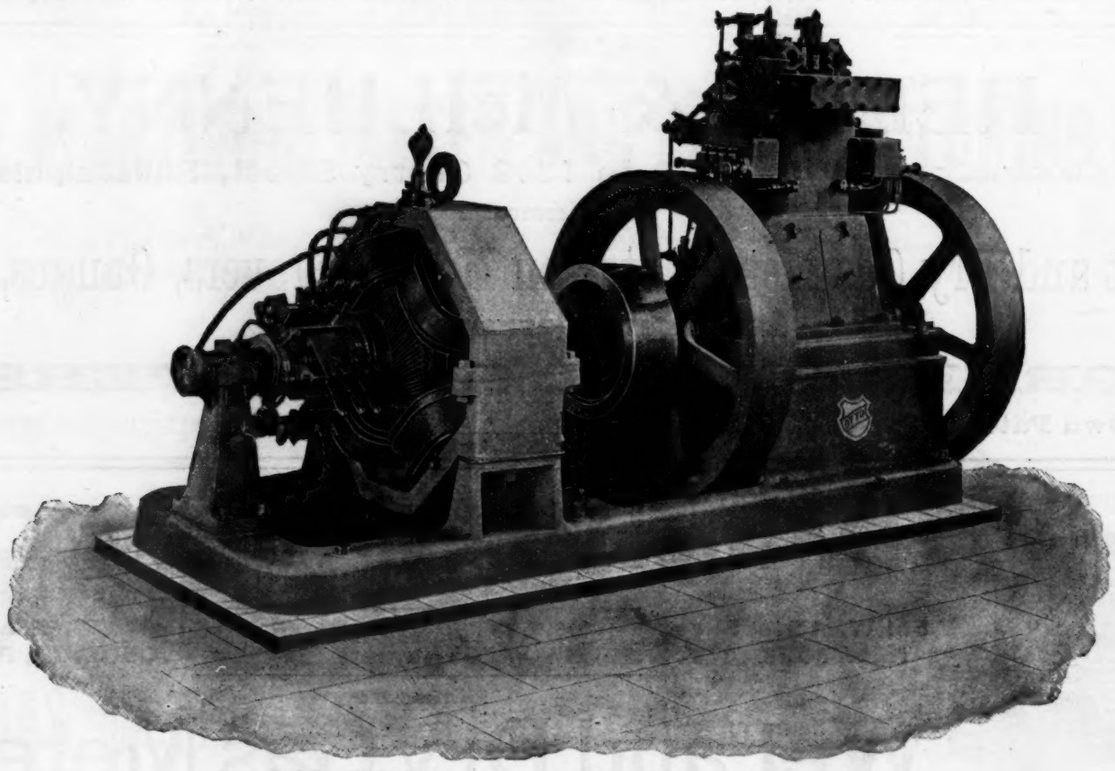

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